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REPORT

OF THE

NATIONAL ACADEMY OF SCIENCES

FOR THE YEAR

1922

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1923

REPORT

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LETTER OF TRANSMITTAL.

NATIONAL ACADEMY OF SCIENCES,
Washington, D. C., December 29, 1922.

SIR: I have the honor to transmit to you herewith the report of the president of the National Academy of Sciences for the fiscal year ended June 30, 1922.

Very respectfully,

CHARLES D. WALCOTT,
President.

Hon. CALVIN COOLIDGE,
Vice President of the United States.

ACT OF INCORPORATION.

AN ACT To incorporate the National Academy of Sciences.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That Louis Agassiz, Massachusetts; J. H. Alexander, Maryland; S. Alexander, New Jersey; A. D. Bache, at large; F. B. Barnard,[1] at large; J. G. Barnard, United States Army, Massachusetts; W. H. C. Bartlett, United States Military Academy, Missouri; U. A. Boyden,[2] Massachusetts; Alexis Caswell, Rhode Island; William Chauvenet, Missouri; J. H. C. Coffin, United States Naval Academy, Maine; J. A. Dahlgren,[2] United States Navy, Pennsylvania; J. D. Dana, Connecticut; Charles H. Davis, United States Navy, Massachusetts; George Englemann, Saint Louis, Missouri; J. F. Frazer, Pennsylvania; Wolcott Gibbs, New York; J. M. Giles,[3] United States Navy, District of Columbia; A. A. Gould, Massachusetts; B. A. Gould, Massachusetts; Asa Gray, Massachusetts; A. Guyot, New Jersey; James Hall, New York; Joseph Henry, at large; J. E. Hilgard, at large, Illinois; Edward Hitchcock, Massachusetts; J. S. Hubbard, United States Naval Observatory, Connecticut; A. A. Humphreys, United States Army, Pennsylvania; J. L. Le Conte, United States Army, Pennsylvania; J. Leidy, Pennsylvania; J. P. Lesley, Pennsylvania; M. F. Longstreth, Pennsylvania; D. H. Mahan, United States Military Academy, Virginia; J. S. Newberry, Ohio; H. A. Newton, Connecticut; Benjamin Peirce, Massachusetts; John Rodgers, United States Navy, Indiana; Fairman Rogers, Pennsylvania; R. E. Rogers, Pennsylvania; W. B. Rogers, Massachusetts; L. M. Rutherford, New York; Joseph Saxton, at large; Benjamin Silliman, Connecticut; Benjamin Silliman, junior, Connecticut; Theodore Strong, New Jersey; John Torrey, New York; J. G. Totten, United States Army, Connecticut; Joseph Winlock, United States Nautical Almanac, Kentucky; Jeffries Wyman, Massachusetts; J. D. Whitney, California; their associates and successors duly chosen, are hereby incorporated, constituted, and declared to be a body corporate, by the name of the National Academy of Sciences.

SEC. 2. *And be it further enacted,* That the National Academy of Sciences shall consist of not more than fifty ordinary members, and

[1] The official list of members gives the name of F. A. P. Barnard.
[2] Declined.
[3] The official list of members gives the name of J. M. Gillis.

the said corporation hereby constituted shall have power to make its own organization, including its constitution, by-laws, and rules and regulations; to fill all vacancies created by death, resignation, or otherwise; to provide for the election of foreign and domestic members, the division into classes, and all other matters needful or usual in such institution, and to report the same to Congress.

SEC. 3. *And be it further enacted*, That the National Academy of Sciences shall hold an annual meeting at such place in the United States as may be designated, and the academy shall, whenever called upon by any department of the Government, investigate, examine, experiment, and report upon any subject of science or art, the actual expense of such investigations, examinations, experiments, and reports to be paid from appropriations which may be made for the purpose, but the academy shall receive no compensation whatever for any services to the Government of the United States.

SOLOMON FOOTE,
President of the Senate pro tempore.
GALUSHA A. GROW,
Speaker of the House of Representatives.

Approved, March 3, 1863.
ABRAHAM LINCOLN, *President.*

AMENDMENTS.

AN ACT To amend the act to incorporate the National Academy of Sciences.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the act to incorporate the National Academy of Sciences, approved March third, eighteen hundred and sixty-three, be, and the same is hereby, so amended as to remove the limitation of the number of ordinary members of said academy as provided in said act.

Approved, July 14, 1870.

AN ACT To authorize the National Academy of Sciences to receive and hold trust funds for the promotion of science, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the National Academy of Sciences, incorporated by the act of Congress approved March third, eighteen hundred and sixty-three, and its several supplements, be, and the same is hereby, authorized and empowered to receive bequests and donations and hold the same in trust, to be applied by the said academy in aid of scientific investigations and according to the will of the donors.

Approved, June 20, 1884.

AN ACT To amend the act authorizing the National Academy of Sciences to receive and hold trust funds for the promotion of science, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the act to authorize the National Academy of Sciences to receive and hold trust funds for the promotion of science, and for other purposes, approved June twentieth, eighteen hundred and eighty-four, be, and the same is hereby, amended to read as follows:

"That the National Academy of Sciences, incorporated by the act of Congress approved March third, eighteen hundred and sixty-three, be, and the same is hereby, authorized and empowered to receive, by devise, bequest, donation, or otherwise, either real or personal property, and to hold the same absolutely or in trust, and to invest, reinvest, and manage the same in accordance with the provisions of its constitution, and to apply said property and the income arising therefrom to the objects of its creation and according to the instructions of the donors: *Provided, however*, That the Congress may at any time limit the amount of real estate which may be acquired and the length of time the same may be held by said National Academy of Sciences."

SEC. 2. That the right to alter, amend, or repeal this act is hereby expressly reserved.

Approved, May 27, 1914.

NATIONAL ACADEMY OF SCIENCES.

In 1863 Henry Wilson, United States Senator from Massachusetts, later Vice President of the United States, asked a number of men eminent in science to come together to form an organization by which the scientific strength of the country might be brought to the aid of the Government. This meeting was directly the result of an act of Congress passed March 3, 1863, incorporating the National Academy of Sciences of the United States of America. While Senator Wilson presumably had aid and suggestions from the incorporators, the bill had its inception with and was drawn by him, and did not incorporate the academy in any State or Territory or in the District of Columbia. It seems to have been his idea that the academy should be national in its broadest sense.

The academy has held its annual meetings in Washington at the Smithsonian Institution and its autumn meetings in other cities. Joseph Henry was president for many years and at the same time secretary of the institution. The records and library of the academy have been stored in several hundred boxes at the institution, awaiting such time as the academy may have a building of its own where this material can be made available.

The semicentennial in 1913 seemed to give new life to the activities of the academy, and the foreign secretary, Dr. George E. Hale, proposed then that the academy should have a home. He prepared tentative plans and had them put in shape at his own expense by an architect who could appreciate the need for and the requirements of a research institution. This building as proposed provided laboratories and a library for the use of the academy and resident men of science for research work. The one serious drawback which delayed its consummation was lack of funds.

The project was not to be long delayed, for the World War coming in 1914 changed and broadened the thought of the world. What started to be a battle of armed forces turned to competition between the countries at war in creative scientific research, looking to the destruction of masses instead of individuals. This led to the need in this country of a body that could bring together the most able men in the fields of science for the solution of war problems. Doctor Hale, conceiving the need for such a service long before it was an actual necessity, proposed that the academy take preliminary steps in the organization of the scientific resources of the United States,

and this was the beginning of the National Research Council which rendered such effective service at the request of the President of the United States during the war.

Appreciation of this war service of the academy was shown in an Executive order issued by President Wilson, requesting the National Academy of Sciences to continue the council. Under this order the research council was reorganized on a permanent peace basis as an agent of the academy, and the need of the academy for a home was accentuated. Doctor Hale's previous plans were discussed at length, but the obstacle of lack of money continued. The quarters in the Smithsonian Institution, already too crowded, could not afford room for this new body, and temporary space elsewhere was sought. During the war a few rooms in the Munsey Building on the north side of E Street, between Thirteenth and Fourteenth, were first occupied. Later a residence at Sixteenth and L Streets, having 21 rooms, was secured. Still later, a larger building, at Sixteenth and M Streets, was occupied until the present location at Seventeenth and Massachusetts Avenue was leased.

Efforts were made to secure a permanent endowment and money for a building for the academy, and a suggestion was made to the Carnegie Corporation of an endowment and a building for the academy and research council, resulting in an offer of $5,000,000 provided the academy would secure a site. The amount needed for the purchase of this site was apportioned, so that the entire country might have a part in this great enterprise. With this plan in view, the raising of funds for the purchase of the ground was accomplished through the efforts of Doctor Hale, Doctor Millikan, and others.

The lot purchased by the academy is known as square 88, which is bounded on the north by C Street, on the west by Twenty-second Street, on the east by Twenty-first Street, and on the south by Upper Water Street. It has had considerable filling. Originally its highest point was in the northwest corner, and its lowest point was under water in the river at the southeast. To-day its lowest point is about 24 feet above high water and its highest 41 feet. The borings show that there is a fill of from 5 to 10 feet where the building will stand, resting on from 6 to 28 feet of clay and sand, and from 7 inches to 3 feet of decomposed rock. Below this last is good rock upon which the foundations of the building will rest.

With the acquiring of the site and its acceptance by the Carnegie Corporation, attention was given immediately tc the securing of an architect, and in 1919 Mr. Bertram Grosvenor Goodhue, of New York, was selected and requested to make tentative plans along certain lines which the building committee had in mind. After consideration of other designs the plans finally reverted to the classical style for a building three stories in height.

The main entrance will face B Street, halfway between Twenty-first and Twenty-second Streets. A broad walk with reflecting pools in the center will lead through a formal effect of trees and shrubs to the building surmounting a series of terraces, in the middle of the square. A deep terrace of stone surrounded by a massive railing of marble will extend the entire length of the front. Two magnificent marble and bronze lamps, one on each side of the entrance, are to symbolize enlightenment that will come from within. A frieze inscribed with the names of distinguished men of science will add its inspiration.

Massive bronze doors will open upon surroundings that invite further inspection. The vestibule, with walls and floors of marble, is to lead to a great entrance hall, also of marble, but of warmer tone. On one side of the hall there will be a seismograph, on the other side a magnetograph, giving automatic and continuous records.

In the rotunda there will be in actual operation apparatus demonstrating certain fundamental facts hitherto but vaguely appreciated by many. A coelostat telescope, mounted on the dome of the central rotunda, will form a large image of the sun on the white surface of a circular table in the middle of the room. Here the sun spots may be seen, changing in number and form from day to day and moving across the disk as the sun turns on its axis. A 60-foot pendulum, similar to that exhibited by Foucault at the Pantheon at Paris in 1851, will be suspended from the center of the dome, demonstrating by its oscillations his celebrated experiment showing the diurnal motion of the earth.

This large hall, rich in its warmth of treatment of color, will be surrounded by five exhibition rooms in which will be shown the results of future work of the academy and research council. The library, with its impressive shelves filled with volumes printed in many languages and covering all branches of scientific effort, will be on the same floor, with a quiet reading room just beyond. To the east will be situated the lecture room and the conference room for smaller meetings.

In the west front of the basement of the building there will be a room under the library for additional library stacks. On the east a room that may be used as a dining room or for entertainment at any of the functions that may be held by the academy or research council. Under the entrance hall is to be another exhibition room; and north of that, the boiler rooms and other appliances for heating and ventilating, storage rooms, etc. The second and third floors will contain 57 rooms which will be used for the administrative offices of the National Academy of Sciences and the National Research Council.

The building has a frontage of 260 feet and is 140 feet deep. The height above the first floor is 60 feet. The vestibule is 11 by 20 feet;

the entrance hall, 36 by 21 feet; the central hall, 64 by 24 feet; the library, 36 by 64 feet; the lecture room, 34 by 50 feet. The five exhibition halls range in size from 26 by 14 to 34 by 21 feet.

The total number of square feet of floor space, exclusive of elevators, doorways, and hallways, is 39,874. This includes exhibition space, amounting to 14,571 square feet, lecture and entertainment space of 7,982, and 14,786 square feet for administrative purposes. Every modern convenience and facility will be provided.

This building for the National Academy of Sciences and the National Research Council is to be the focus of science in America and will be looked upon by our fellow citizens and the world at large as emblematic of all the creative mind will be able to do to bring about a better existence for the future people of the world, for it is to their enlightenment and advancement that it is dedicated.

ANNUAL REPORT OF THE NATIONAL ACADEMY OF SCIENCES.

MEETINGS OF THE NATIONAL ACADEMY.

AUTUMN MEETING.

The autumn meeting of the academy was held at the University of Chicago, November 14, 15, and 16, 1921.

BUSINESS SESSION.

Twenty-eight members responded to roll call, as follows:

Barnard, E. E.	Frost, E. B.	Moore, E. H.
Bliss, G. A.	Harkins, W. D.	Moulton, F. R.
Carlson, A. J.	Hektoen, Ludvig	Noyes, W. A.
Chamberlin, T. C.	Herrick, C. J.	Pearl, Raymond
Comstock, G. C.	Leuschner, A. O.	Slipher, V. M.
Coulter, J. M.	Lillie, F. R.	Stebbins, Joel
Crew, Henry	Mendenhall, C. E.	Stieglitz, Julius
Dickson, L. E.	Michelson, A. A.	Van Vleck, E. B.
Donaldson, H. H.	Miller, G. A.	Wilson, Edwin B.
Forbes, S. A.		

PRESIDENT'S ANNOUNCEMENTS.

Announcement was made of the following deaths and assignments for preparation of biographical memoirs of deceased members:

To Theodore Lyman, the biography of E. B. Rosa, elected 1913, died May 17, 1921.

To F. M. Chapman, the biography of J. A. Allen, elected 1876, died August 29, 1921.

To Liberty H. Bailey, the biography of H. P. Armsby, elected 1920, died October 19, 1921.

The apointment of the following delegates was announced:

Arthur L. Day to the inauguration of James Rowland Angell as president of Yale University, June 22, 1921.

Henry Prentiss Armsby to the inauguration of President Thomas, of Pennsylvania State College, October 1, 1921.

J. Walter Fewkes to the inauguration of Julian Alvin Carroll Chandler as president of William and Mary College, October 19, 1921.

H. H. Donaldson to the inauguration of Frank Aydelotte as president of Swarthmore College, October 22, 1921.

The receipt was announced of the following gifts:

From the University of Virginia, a bronze medal in commemoration of the centennial anniversary of its foundation.

From the Wisconsin Academy of Sciences, Arts, and Letters, a bronze medallion in commemoration of its semicentennial anniversary.

From the trustees of the William Ellery Hale Fund, the sum of $1,000 for the support of the Proceedings.

TRUST FUNDS.

On account of trust funds, the following receipts were announced:

From the Pennsylvania Co. for Insurances on Lives and Granting Annuities, on account of the Joseph Henry Fund:

Principal	$17,539.57	
Income	1,311.41	
		$18,850.98

From the executors of the estate of Mary Anna Palmer Draper, on account of the Billings Fund: Principal, $3,750; making a total of $19,250.

NEW BUILDING.

The following report was presented by the joint committee on the building of the National Academy of Sciences and National Research Council:

Blue-print plans of the new building for the National Academy and the National Research Council from the architect, Bertram Grosvenor Goodhue, were shown to the academy and met with approval. It was stated that work on these plans would be completed within a very short time, when contracts for the building would be drawn.

RESEARCH FUNDS.

J. LAWRENCE SMITH FUND.

The following report from the committee on the J. Lawrence Smith Fund was presented:

The committee of the academy on the J. Lawrence Smith Fund recommends that the gold medal provided for by this fund be awarded at the annual meeting in April, 1922, to Dr. George Perkins Merrill, United States National Museum, for his important contributions to knowledge concerning the character of meteorites. Doctor Merrill's investigations have extended over many years, and the list of his published papers embraces more than 50 titles. His work has been notable for its scope and thoroughness and the philosophical standpoint from which it has been conducted. His object has been to contribute toward the solution of the problem of the origin and significance of these extraterrestrial bodies.

Doctor Merrill's researches have been concerned with the mineral, chemical, and textural characters of both metallic and stony meteorites and with the interpretation of these properties. It is the opinion of the committee that Doctor Merrill is to-day the most eminent investigator of meteorites in the world and richly deserves the honor recommended. Many of his more recent and specially valuable results have

been secured with the aid of grants from the J. Lawrence Smith fund, which have been judiciously expended.

The deed of gift of the J. Lawrence Smith fund indicates that the medal award stood very prominently in the donor's mind. In fact, it has been awarded but once, namely, in 1888 to H. A. Newton, of the Yale observatory, "for observations of the orbits of meteorites."

The committee recommends that a grant of $500 be made to Dr. George P. Merrill, United States National Museum, from the accumulated income of the J. Lawrence Smith fund, in aid of further investigations on the character of meteorites. The committee feels that the excellent use made of previous grants is ample assurance that this grant will be well spent. No other application for a grant is before the committee.

It is respectfully requested that the academy take action on both of the above recommendations.

For the committee.

WHITMAN CROSS, *Chairman.*

Received. Award of medal and grant approved.

HENRY DRAPER FUND.

The following report was presented from the committee on the Henry Draper fund:

The Henry Draper committee recommends that the Henry Draper gold medal of the academy be awarded to Prof. Henry Norris Russell at the next stated meeting of the academy. The chief reason for the award lies in the remarkably valuable contributions which Professor Russell has made to our knowledge of the processes of stellar evolution and the underlying causes therefor. Upon receipt of information that the recommendation of the committee has been confirmed by the council, a fuller statement of reasons governing the award will be supplied for use at the next stated meeting and for publication in the minutes thereof.

W. W. CAMPBELL, *Chairman.*

Recommendation approved.

WATSON FUND.

The following report from the trustees of the James Craig Watson fund was presented:

The trustees of the James C. Watson fund respectfully recommend that the following grants be authorized:

Five hundred dollars to Dr. William Bowie, United States Coast and Geodetic Survey, for the continuation of observations of the variation of latitude at the international latitude observatory at Ukiah, Calif.

Five hundred dollars to the Lick Observatory, Mount Hamilton, Calif., as a contribution to the sum of $4,000 required for a Ross photographic zenith telescope for a study of latitude variations under the direction of W. W. Campbell in connection with an astronomical, geodetic, seismological, and geological research project concerning the northerly movement of a section of the Pacific coast recently discovered by Prof. A. C. Lawson, of the University of California.

A. O. LEUSCHNER, *Chairman.*
W. L. ELKIN.
GEORGE C. COMSTOCK.

Grants approved.

JOSEPH HENRY FUND.

The committee on the Joseph Henry fund presented the following recommendations:

The committee on the Henry fund desires to submit for the approval of the academy the following general statement regarding its proposed policy in the administration of this fund:

The terms of the deed of gift provide that after the death of the last survivor of the immediate family of Professor Henry the capital sum shall be transferred to the National Academy of Sciences, to be forever held in trust, and the income from which shall be from time to time applied to assist "meritorious investigations in natural science, especially in the direction of original research."

Under these terms there is imposed no limitation regarding the field of science in which an award may be made. Since, however, this fund in its original inception was organized during Professor Henry's lifetime for the purpose of enabling him the better to carry on his scientific work, and since it now stands, in some measure, as a monument to his name and to his contributions to science, it would seem not improper that, among projects of equal merit otherwise, some preference should be shown to those which may lie nearer to the fields of work with which Professor Henry's name is usually associated. The committee does not, however, desire to impose in advance any specific limitation or restriction, and it will therefore be prepared to consider applications from all fields of natural science.

W. F. DURAND, *Chairman.*

Approved.

The committee on the Henry fund desires further to recommend as follows:

That, of the amount of interest thus far received and amounting to $1,311.41, the sum of $388.32 be transferred to the capital account, thus bringing the present valuation of the fund ($39,611.68) up to the original face value of $40,000.

W. F. DURAND, *Chairman.*

Transfer approved.

In accordance with application, a copy of which is attached hereto, the committee of the Henry fund desires to recommend for the approval of the academy:

Grant No. 1. To the Lick Observatory, Mount Hamilton, Calif., Dr. W. W. Campbell, director, the sum of $500, as a contribution toward the sum of $4,000 required for a Ross photographic zenith telescope for latitude variation study.

W. F. DURAND, *Chairman.*

Grant approved.

METRIC SYSTEM.

A communication from Senator E. F. Ladd requesting a declaration of the opinion of the academy on the adoption of the metric system as provided for in bill S. 2267, introduced by him in the Senate under date of July 18, 1921, was read before the academy, together with the bill, and after discussion the matter was referred to the committee on weights, measures, and coinage, with power to act through the president of the academy.

The text of the bill is as follows:

A BILL To fix the metric system of weights and measures as the single standard of weights and measures for certain uses.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That from and after ten years from the date of passage and

approval of this act the weights and measures of the meter-liter-gram or metric system shall be the single standard of weights and measures in the United States of America for the uses set out herein.

SEC. 2. That the national prototypes of the fundamental standards of the metric system shall be the copies of the standards known as meter numbered twenty-seven and kilogram numbered twenty, allotted to the United States by the general conference of weights and measures held at Paris in 1889. These are now deposited in the vault of the Bureau of Standards of the Department of Commerce and are those which are now used and employed in deriving the values of all weights and measures used in the United States. These national representations are hereby adopted as the primary standards of weights and measures for the United States of America, and from these all other weights and measures shall be derived and ascertained.

SEC. 3. That from and after ten years from the date of passage and approval of this act no person shall do or offer or attempt to do any of the following acts, by weights or measures, in or according to any other system than the metric system of weights and measures, namely:

(1) Sell any goods, wares, or merchandise except for export, as provided in section 8.

(2) Charge or collect for the carriage or transportation of any goods, wares, or merchandise.

SEC. 4. That from and after ten years from the date of passage of this act no person shall use or attempt to use in any of the transactions detailed in section 3 any weight or measure or weighing or measuring device designed, constructed, marked, or graduated in any other system than the metric system of weights and measures.

SEC. 5. That not later than ten years from the date of passage and approval of this act all postage, excises, duties, and customs charged or collected by weights or measures by the Government of the United States shall be charged or collected in or according to the metric system of weights and measures.

SEC. 6. That rules and regulations for the enforcement of this act not inconsistent with the provisions hereof shall be made and promulgated by the Secretary of Commerce. The Secretary of Commerce shall also take such steps as he may deem expedient for giving publicity to the dates of transition specified herein and for facilitating the transition to the meter-liter-gram or metric system.

SEC. 7. That all acts or parts of acts inconsistent herewith are hereby repealed, but only in so far as they are inconsistent herewith; otherwise they shall remain and continue in full force and effect. Whenever in any act, or rules and regulations, or tariff or schedule made, ratified, approved, or revised by the Government of the United States of America weights or measures of the system now in customary use are employed or referred to, and to comply with the provisions of this act weights and measures of the metric system should be employed, then such references in such act, rules and regulations, tariff, or schedule shall be understood and construed as references to equivalent weights or measures of the metric system ascertained in accordance with the required degree of accuracy.

SEC. 8. That nothing in this act shall be understood or construed as applying to—

(1) Any contract made before the date at which the provisions of this act take effect.

(2) The construction or use of the arts, manufacture, or industry of any specification or drawing, tool, machine, or other appliance or implement designed, constructed, or graduated in any desired system.

(3) Goods, wares, or merchandise intended for sale in any foreign country, but if such goods, wares, or merchandise are eventually sold for domestic use or consumption then this clause shall not exempt them from the application of any of the provisions of this act.

SEC. 9. That nothing herein shall be understood or construed as prohibiting the enactment or enforcement of weights and measures laws or ordinances by the various

States or cities, and the various States or cities shall have the same powers as though this act were not in force and effect: *Provided, however,* That no standard weights or measures shall be established for the uses set out herein which conflict in any way with the standards established herein, and such standards which may already have been established shall be null and void for the uses set out herein.

SEC. 10. That the word "person" as used in this act shall be construed to import both the plural and singular, as the case demands, and shall include corporations, companies, societies, and associations. When construing and enforcing the provisions of this act, the act, omission, or failure of any officer, agent, or other person acting for or employed by any corporation, company, society, or association, within the scope of his employment or office, shall in every case be also deemed to the act, omission, or failure of such corporation, company, society, or association as well as that of the person.

The home secretary was requested to transmit the thanks of the academy to the president and board of trustees of the University of Chicago, the director of the Yerkes Observatory, the members of the Quadrangle Club, the members of the Chaos Club, and members residing in Chicago serving as a local committee, for courtesies extended to members of the National Academy of Sciences during the autumn meeting.

SCIENTIFIC SESSIONS.

MEETING OF NOVEMBER 14–16, 1921.

The scientific sessions of the academy were held in the Julius Rosenwald Geologic and Geographic Laboratories and Museum, on the campus of the University of Chicago. On Wednesday, November 16, the director and staff of the Yerkes Observatory at Williams Bay, Wis., received members of the academy and their friends.

SCIENTIFIC PAPERS.

MONDAY, NOVEMBER 14.

Raymond Pearl and Sylvia L. Parker: Life tables for drosophila.

Thomas C. Chamberlin: The contrasted types of earth energy and their relative values.

Thomas C. Chamberlin: The paths taken by energy in the self-compression of the earth.

S. W. Parr (introduced by W. A. Noyes): A new theory of the carbonization of coal.

Harvey Fletcher and R. L. Wegel (introduced by J. J. Carty and F. B. Jewett): The frequency-sensitivity characteristic of normal ears.

C. J. Herrick: Some factors in forebrain development.

W. A. Noyes and Walther Goebel: Catalysis of the formation of acetamide by acetic acid.

Mildred Booth and Frank Schlesinger: The parallaxes of 57 stars. (Read by title.)

G. A. Bliss: The transformation of Clebsch in the calculus of variations.

G. A. Miller: Group of isomorphisms of a transitive substitution group.

E. H. Moore: Concerning the reciprocal of a matrix in general analysis.

William D. Harkins and Anson Hayes: The separation of the isotopes of chlorine.

William D. Harkins and R. S. Mulliken: The separation of the isotopes of mercury.

E. E. Barnard: The dark markings in the Milky Way.

E. W. Washburn and Louis Navias (introduced by W. A. Noyes): A physico-chemical study of flint and chalcedony.

Gerald L. Wendt and Robert S. Landauer (introduced by J. Stieglitz): Further experiments on the ozone form of hydrogen.

W. H. Rodebush (introduced by W. A. Noyes): Entropy of cadmium.

A. A. Michelson: Progress in the application of interference methods at Mount Wilson.

TUESDAY, NOVEMBER 15.

A. J. Carlson: Some physiological actions of saccharin and their bearing on the use of saccharin in foods.

K. K. Koessler and M. T. Hanke (introduced by L. Hektoen): Studies on the proteinogenous amines.

S. B. Hopkins (introduced by W. A. Noyes): Observations on the rare earths.

R. R. Bensley (introduced by C. J. Herrick): The structure of the posterior lobe of the pituitary body.

C. H. Eigenmann (introduced by F. R. Lillie): The nature and origin of the fresh-water fishes of the Pacific slope of South America.

Preston Kyes (introduced by C. J. Herrick): The mechanism of red blood corpuscle destruction.

Julius Stieglitz: Isomeric dimethyl murexides and the theory of color production in organic dyes.

H. I. Schlesinger (introduced by J. Stieglitz): The solubility-product of barium manganate.

C. J. Chamberlain (introduced by J. M. Coulter): Growth rings in the monocots.

J. B. Brown and G. D. Beal (introduced by W. A. Noyes): The highly unsaturated acids of fish oils.

Maud Slye (introduced by L. Hektoen): The influence of heredity on the incidence of cancer.

Edward Kasner: Einstein's cosmological field equations. (Read by title.)

George P. Merrill (introduced by C. D. Walcott): A meteoric iron from Owens Valley, Calif. (Read by title.)

L. E. Dickson: Quaternions in the theory of numbers.

H. B. Lewis (introduced by W. A. Noyes): The intermediary metabolism of cystine.

Lydia M. DeWitt (introduced by L. Hektoen): Studies on the chemotherapy of tuberculosis.

A. B. Coble (introduced by G. A. Miller): The tritangent planes of the normal space sextic of genus four.

A. B. Luckhardt (introduced by A. J. Carlson): On the specificity of gastrin and secretin.

W. D. MacMillan (introduced by E. H. Moore): On certain divergent series.

Henry C. Cowles (introduced by J. M. Coulter): Ecological features of the Red River, a representative braided stream.

L. R. Dragstedt (introduced by A. J. Carlson): On the cause of death from intestinal obstruction.

G. W. Bartelmez (introduced by C. J. Herrick): The neural crest and the primary subdivisions of the neural folds in young human embryos.

Esmond R. Long (introduced by L. Hektoen): Biochemistry of the tubercle bacillus.

George L. Clark (introduced by W. D. Harkins): The properties of salts as related to atomic dimensions.

ANNUAL MEETING.

The annual meeting of the academy was held at the Smithsonian Institution in Washington, April 24, 25, and 26, 1922.

Eighty-seven members and one foreign associate were present, as follows:

Abbot, C. G.
Ames, J. S.
Bancroft, W. D.
Birkhoff, G. D.
Calkins, G. N.
Carty, John J.
Cattell, J. McK.
Chapman, F. M.
Clarke, F. W.
Clarke, J. M.
Conklin, E. G.
Crew, Henry
Cross, Whitman
Dall, W. H.
Davenport, C. B.
Day, Arthur L.
Dickson, L. E.
Donaldson, H. H.
Duane, William
Dunn, Gano
Fewkes, J. W.
Flexner, Simon
Freeman, J. R.
Gomberg, Moses
Hale, George E.
Hall, Edwin H.
Halsted, W. S.
Harkins, W. D.
Harper, R. A.
Harrison, R. G.
Hayford, John F.
Henderson, L. J.
Hillebrand, W. F.
Holmes, W. H.
Howard, L. O.
Howell, W. H.
Hrdlicka, Ales
Hunt, Reid
Jennings, H. S.
Jewett, F. B.
Jones, L. R.
Kasner, Edward
Kemp, James F.
Lillie, F. R.
Lyman, Theodore
McClung, C. E.
Mark, E. L.
Mendel, L. B.
Mendenhall, C. E.
Mendenhall, T. C.
Merriam, C. H.
Merriam, J. C.
Merritt, Ernest
Miller, D. C.
Millikan, R. A.
Morgan, T. H.
Morse, E. S.
Moulton, F. R.
Nichols, E. L.
Noyes, Arthur A.
Osborn, H. F.
Osterhout, W. J. V.
Pearl, Raymond
Pupin, Michael I.
Ransome, F. L.
Robinson, B. L.
Scott, William B.
Smith, Erwin F.
Squier, George O.
Stebbins, Joel
Stieglitz, Julius
Stratton, S. W.
Taylor, D. W.
Trowbridge, Augustus
Ulrich, E. O.
Van Vleck, E. B.
Vaughan, T. W.
Vaughan, V. C.
Veblen, Oswald
Walcott, C. D.
Welch, Wm. H.
Wheeler, W. M.
White, David
White, H. S.
Wilson, E. B.
Wood, Robert W.
Woodward, R. S.
Lorentz, H. A.[1]

BUSINESS SESSIONS.

The annual report of the president, containing that of the treasurer for the year 1921, in printed form, was presented, accepted, and distributed to members.

The president announced the following:

The death of John Casper Branner, March 1, 1922, his biography assigned to Bailey Willis.

The biography of E. B. Rosa was reassigned to S. W. Stratton.

Announcement was made of—

The following appointments:

[1] Foreign associate.

Trust fund committees.

Fund.	Appointed.	To succeed.	Term expiring.
Bache	R. G. Harrison	Chairman	
	H. D. Curtis	E. B. Frost	
Smith	Whitman Cross	Himself	1927
Draper	A. A. Michelson	Himself	1927
Comstock	Henry Crew	A. G. Webster	1927
Hartley	S. W. Stratton	Chairman	1925
	S. W. Stratton	Himself	1925
	J. R. Angell	A. A. Noyes	1925
Marsh	J. C. Merriam	Himself	1925
Murray	W. M. Davis	Himself	1925
Thompson	J. M. Clarke	Himself	1925
Science Service	J. C. Merriam	Himself	1924

The election of the following as chairmen of the sections:

Mathematics—Oswald Veblen.
Botany—Liberty H. Bailey.
Zoology and animal morphology—Ross G. Harrison.
Physiology and pathology—Graham Lusk.

The appointment of the following delegates:

University of Southern California, to the inauguration of Rufus Bernhard von KleinSmid as president, April 24 to 26, Walter S. Adams.

International Astronomical Union, to the sessions at Rome, beginning May 2, 1922: R. G. Aitken, L. A. Bauer, Wm. Bowie, H. D. Curtis, Edward Kasner, O. J. Lee, Frank B. Littell, W. F. Meggers, John A. Miller, H. N. Russell, C. E. St. John, Frank Schlesinger (chairman), F. H. Seares, Harlow Shapley, Joel Stebbins.

International Union of Geodesy and Geophysics, to the sessions at Rome, beginning May 2, 1922: L. A. Bauer, Wm. Bowie, H. H. Kimball, G. W. Littlehales, R. A. Millikan, H. Fielding Reid, Frank Schlesinger, H. S. Washington.

University of Padua, to the seventh centenary celebration, May 14 to 17, 1922: H. D. Curtis and F. H. Seares.

American Academy of Political and Social Science, to its meeting at Philadelphia, May 12 and 13, 1922: E. G. Conklin, H. H. Donaldson, C. E. McClung.

International Research Council, to the meeting at Brussels beginning July 18, 1922: George E. Hale and R. A. Millikan.

TRUST FUND RECEIPTS.

The receipt was announced of a third payment on the legacy left to the academy by Mrs. Mary Anna Plamer Draper, amounting to $2,500, bringing the capital of the Billings fund up to $21,750.

The entire capital of the Joseph Henry Fund, amounting to $39,547.04, it was announced, has now been paid in to the academy by the Pennsylvania Co. for Insurances on Lives and Granting Annuities. By the addition of interest to the principal during the coming fiscal year, the capital will be brought up to the sum of $40,000, as originally intended.

REPORT OF THE COMMITTEE ON WEIGHTS, MEASURES, AND COINAGE.

The president reported that, in accordance with the resolution of the academy passed at the autumn meeting, he had forwarded to Senator Ladd the report of the Committee on Weights, Measures, and Coinage on the Ladd bill,[1] approving the bill with the following statement:

Any measure that might be passed is practically certain to need modifications and amendments before the end of the probationary period.

REPORT OF THE TREASURER.

A statement of assets and liabilities as of December 31, 1921, was read, it being understood that a report for the entire fiscal year July 1, 1921, to June 30, 1922, was to appear in the forthcoming report of the president to Congress.

REPORT OF THE HOME SECRETARY.

The home secretary presented the following report, which was accepted:

The PRESIDENT OF THE NATIONAL ACADEMY OF SCIENCES.

SIR: I have the honor to present the following report of the publications and membership of the National Academy of Sciences for the year ending April 24, 1922.

Of the Memoirs of the Academy, volume 15 has been completed in three parts forming one volume of Psychological Examining in the United States Army, edited by Robert M. Yerkes. The demand for this publication has so far exceeded the supply that an additional 1,000 copies were printed, to be sold at $1.75 each by the Superintendent of Documents. The distribution to members and colleges has been made.

Volume 16 has been completed in three parts, as follows: First memoir, Lower California and its Natural Resources, by Edward W. Nelson; second memoir, Life Cycles of the Bacteria, by F. Löhnis; third memoir, A Recalculation of the Atomic Weights, by Frank Wigglesworth Clarke. All of these have been distributed as separates and the completed volume is now being bound and is expected to be issued within a short time.

Volume 17 will be devoted to the biographical memoirs, continuing a series of which volumes 1 to 9 have been issued in octavo form at the expense of the academy. In the future all biographical memoirs will be issued in quarto form as part of the series of scientific memoirs. The following biographies are now in press: Simon Newcomb, biography by W. W. Campbell, bibliography by R. C. Archibald; Richmond Mayor Smith, by Edwin R. A. Seligman; Samuel Hubbard Scudder, by Alfred G. Mayor; George Jarvis Brush, by Edward S. Dana; Samuel Wendell Williston, by Richard S. Lull; and Charles Van Hise, by T. C. Chamberlin.

Volume 18, The Report of the Committee on the Panama Canal Slides, edited by Whitman Cross, to be complete in one volume, is now in the hands of the Public Printer. The illustrations have been approved and proof of the text is expected within a few days.

Two parts of volume 19 are now with the printer: The Tectonic Conditions Accompanying the Intrusion of Basic and Ultrabasic Rocks, by W. N. Benson, first memoir The Parallaxes of Fifty-seven Stars, by Mildred Booth and Frank Schlesinger, second memoir.

[1] Senate bill, S. 2267.

Manuscripts for the biographical memoirs of Benjamin Apthorp Gould, by George C. Comstock, that of Henry Pickering Bowditch, by W. B. Cannon, to be published as part of volume 17, are in the hands of the home secretary.

Since the last annual meeting I have to report the deaths of Edward Bennett Rosa, elected 1913, died May 17, 1921; Joel Asaph Allen, elected 1876, died August 29, 1921; Henry Prentiss Armsby, elected 1920, died October 19, 1921; John Casper Branner, elected 1905, died March 1, 1922; and of two foreign associates, Wilhelm Waldeyer, elected 1909, and Marie Ennemond Camille Jordan, elected 1920.

The present active membership of the academy is 198 members and 36 foreign associates.

C. G. ABBOT, *Home Secretary.*

AMENDMENT TO CONSTITUTION.

The following amendment to the constitution, recommended by the executive committee of the Proceedings, was approved by the committee of the whole:

Article 5, section 3 of the constitution of the National Academy contains the following paragraph:

The Proceedings shall include the transactions of the academy, brief original announcements of the results of scientific investigations made by members of the academy or others, together with short original articles giving a comprehensive survey of the more important scientific researches currently made by American investigators and other matters of general scientific interest.

It is proposed that this paragraph shall be replaced by the following:

The Proceedings shall be primarily a medium of first publication for original articles in brief form of permanent scientific value.

AMENDMENT TO RULES.

Upon the recommendation of the executive committee of the Proceedings, the second, fourth, fifth, sixth, and seventh paragraphs of Rule V:1 were repealed.

RESEARCH FUNDS.

BACHE FUND.

Since the last annual meeting the following grants have been made:

229. H. Nort, Gouda, Holland, $200. For counting the stars on the Franklin Adams charts.

230. H. S. Jennings, Johns Hopkins University, Baltimore, $300. To study the cytology of the rhizopod difflugia.

231. Herbert M. Evans, University of California, Berkeley, Calif., $500. To determine the oestrus cycle by means of histological changes in the vaginal and uterine fluid in other mammals than the rat (rabbit and cat especially).

232. Carl G. Hartman, University of Texas, Austin, $500. To complete observations on the oestrus cycle of the opossum.

233. William Bowie, Washington, D. C., $250. Observations at the Ukiah latitude station. This grant has been canceled at the request of Doctor Bowie because of Government appropriations to carry on the work.

Reports of previous grants have been received as follows:

193. Charles A. Kofoid, University of California. Two papers on the parasitic protozoa of the stomach of ruminants, in preparation. Research nearing completion.

211. G. H. Shull, Princeton University. Grant used for part payment of salary of garden attendant. Genetical studies on œnothera and Shepherd's purse are being continued extensively, especially with linkage in the former and duplication of factors and sterility in the latter. Preliminary reports in press.

213. Duncan S. Johnson, Johns Hopkins University. Work on three species, well along. Results not yet published.

214. Carl H. Eigenmann, University of Indiana. Research completed. Published in Memoirs of the Museum of Comparative Zoology, Harvard, vol. 43, parts 1 and 2. Research continued under grant No. 220.

215. H. W. Norris, Grinnell College. Preliminary paper will be published in Proceedings of Iowa Academy of Science, 1922; work on cranial nerves of amia and lepidosteus nearing completion, but the final publication will be included in the report on the ganoids in general.

216. A. A. Schaeffer, Knoxville, Tenn. Research in progress, but delayed by difficulty in obtaining space for experiments. Preliminary report in preparation for publication.

217. H. Nort, Gouda, Holland. Star counts have been made for some more charts of the southern hemisphere; additional counts have been made to find distance correction for the Franklin Adams charts; formulæ have been derived to compute the equatorial coördinates of the fields counted from the declination and the R. A. of the center of the plate and the focal length of the telescope used; the limiting magnitude for 10 additional charts of the northern hemisphere has been derived.

218. J. C. Jensen, University Place, Nebraska. Preliminary results published in Proceedings of Nebraska Academy of Science, 1919. Considerable progress has been made, but delayed by difficulty in apparatus.

219. H. G. Barbour, McGill University, Montreal. Research concluded. Preliminary publication: Proc. Soc. for Exp. Biol. & Med. 1920, XVII, 148–154 and 209–210. Final publication: 1. Journ. Pharm. and Exper. Therap. 1921, XVIII, 165–183. 2. Amer. Journ. Physiol. 1921, LVII, 387–394, 3 and 4. Full reports of the investigations in which Doctors Howard and Baretz collaborated are now ready for publication.

220. Carl H. Eigenmann, University of Indiana (supplementing 214). Results published in Proc. Am. Philos. Soc., Washington Acad. Sci., Indiana University Studies. Research on fishes of upper Amazon basin and fishes of Lake Titicaca in progress.

221. William Bowie, United States Coast and Geodetic Survey. Results published in Proceedings. Reduced Geodetic Association or in Proceedings of Section of Geodesy of the International Geodetic and Geophysical Union. Observations will continue indefinitely.

222. C. H. Warren, Massachusetts Institute of Technology. Paper on "The pegmatites associated with the alkalic granites of Cape Ann, Mass.," ready for publication. Paper on the granitic rocks of Cape Ann well advanced toward publication. Work on a paper dealing with the labradorite porphyries of Essex County, Mass., nearly ready. Work on the mixed granite-porphyry dikes of Briar Neck, Gloucester, Mass., complete; paper to be written this summer.

223. W. Lindgren, Massachusetts Institute of Technology. Chemical work completed. Calculation of analyses and full report will be ready December 1, 1922.

224. T. H. Goodspeed, University of California. Preliminary results published in volume 5, University of California, Publications in Botany. The apparatus purchased with this grant will be used continuously for the illustration of the experiments for an indefinite period.

225. L. B. Mendel and F. P. Underhill, Yale University. Research is in progress and results are quite satisfactory, but not ready for publication.

226. Gilbert N. Lewis, University of California. Number of men are engaged in calculations and checks of the table of free energies which is to be published in a book by Professors Randall and Lewis. Book in in the hands of the publishers.

227. H. W. Norris, Grinnell College. Research in progress. A preliminary report to be published in the 1922 Proceedings Iowa Academy of Sciences. A large amount of material has been collected, but work is delayed by inability to secure an assistant.

228. Preston Edwards, University of Texas. Apparatus has been designed and constructed and some preliminary observations made.

Following the resignation of Prof. E. B. Frost as member and chairman of the Bache fund directors, Prof. Ross G. Harrison was made chairman of the board and Dr. Heber D. Curtis, of the Allegheny Observatory, was elected to fill the vacancy in membership.

The board has voted to consider applications for grants in April and October of each year.

The treasurer of the academy reports that on March 30 there was an unexpended balance of $874.71. Awards which will be made this month will exhaust this and the income of the fund until about September 30 of the present year.

ROSS G. HARRISON,
Chairman Board of Directors of the Bache Fund.

Report received.

WATSON FUND.

The Watson trustees have been advised by Dr. William Bowie, chief Division of Geodesy, United States Coast and Geodetic Survey, that the grant of $500 made from the Watson fund at the fall meeting of the academy for the maintenance of the International Latitude Observatory at Ukiah, can be repaid in full to the academy, in view of the fact that the Congress has appropriated $2,000 for the support of the observatory for the current year.

As Doctor Bowie, the Watson trustees, Doctor Campbell, and other astronomers with whom we have conferred agree that the compensation of the observer has been entirely inadequate and subject to long delays, involving considerable hardship, the Watson trustees recommend that Doctor Bowie be authorized to retain $200 of the sum of $500 granted to him, with the understanding that this sum of $200 be applied to increase the salary of the observer from July 1, 1921, to June 30, 1922.

THE WATSON TRUSTEES.
A. O. LEUSCHNER, *Chairman.*
GEORGE C. COMSTOCK.
WILLIAM L. ELKIN.

Report received and recommendation approved.

DRAPER FUND.

The Henry Draper committee has unanimously recommended that the Draper gold medal for the year 1922 be awarded to Dr. Henry Norris Russell, professor of astronomy and director of the observatory in Princeton University, chiefly in recognition of the remarkably valuable contributions which he has made to our knowledge of the order of stellar evolution and of the underlying causes therefor.

The committee unanimously recommends that the formal presentation of the medal to Professor Russell be delayed until the meeting of the academy to be held in the fall of 1922, on which occasion it is expected that the recipient can be present.

The committee recommends that a grant of $375 be made to Dr. E. A. Fath, professor of astronomy in Carleton College, Northfield, Minn., for the purchase of a string

electrometer in partial equipment of a photoelectric cell photometer for application to the photometry of the stars.

The financial condition of the Henry Draper fund on March 30, 1922, was as follows:

Invested capital	$10,000.00
Invested income	917.50
Income	1,084.08

The sum available for the promotion of research was therefore $2,001.58.

Respectfully submitted.

W. W. CAMPBELL, *Chairman.*

April 14, 1922.

Report received and recommendation approved.

The other members of the committee unanimously recommend a grant of $450 to W. W. Campbell for eclipse apparatus.

C. G. ABBOT.
GEORGE E. HALE.
A. A. MICHELSON.
H. N. RUSSELL.

Recommendation approved.

J. LAWRENCE SMITH FUND.

Medal.—At the November meeting, 1921, the academy approved a recommendation of this committee that the J. Lawrence Smith medal be awarded to Dr. George Perkins Merrill, head curator of the department of geology and paleontology of the United States National Museum, for his important contributions to knowledge concerning meteorites.

Grant 11.—At its November meeting, the academy approved a grant of $500 to Dr. George P. Merrill in aid of further investigations of the character of meteorites. Work under the grant is now in progress.

Publication.—There was issued in 1921 a publication of the Leander McCormick Observatory of the University of Virginia entitled "349 parabolic orbits of meteor streams and other results," by Charles P. Olivier. This is a discussion of 22,000 observations of meteors made by members of the American Meteor Society. It is a comprehensive report of results of an investigation which has been aided by several grants from the J. Lawrence Smith fund made at various times since 1915 to Prof. S. A. Mitchell, director of the McCormick Observatory, under whose supervision the work has been done.

At the April meeting of 1921 the academy approved the expenditure of not more than $300 to defray the expenses of editing and publishing four papers by Mabel Weil, presenting results of investigations by the late C. C. Trowbridge of meteor trains, which have been supported by grants from the J. Lawrence Smith fund, the editing of these papers to be in the hands of Dr. Frank Schlesinger. Some progress has been made during the year.

Financial statement.—The treasurer of the academy reports as follows concerning the J. Lawrence Smith fund as of March 30, 1922:

Invested capital	$10,000.00
Invested income	2,542.50
Uninvested income	1,529.49
Liabilities:	
Grant to G. P. Merrill	430.00
Editing and publishing Trowbridge manuscripts	300.00
Expense of medal (estimated)	210.00

No application for a grant is now before the committee.

WHITMAN CROSS, *Chairman.*

Report received.

WOLCOTT GIBBS FUND.

The directors report that during the current year ending April 1, 1922, no applications for grants have been received and no further grants authorized.

They report also that, to their very great regret, Prof. Charles Loring Jackson has found it impossible to continue his work as chairman of the board and has therefore resigned. The directors desire to put on record their high appreciation of the devoted services which he has rendered to the academy, and to this board as its chairman, since the foundation of the fund 30 years ago, and to express their deep regret that he should be obliged to resign from the board. His successor has not yet been appointed.

According to the report of the treasurer and bursar of the National Academy, the condition of the fund on March 30, 1922 was as follows:

Uninvested cash income	$277.87
Invested income	500.00
Invested capital	5,545.50

T. W. RICHARDS.
EDGAR F. SMITH.

Report received.

COMSTOCK FUND.

As chairman of the committee in charge of the Comstock fund I beg to report as follows:

(1) That since the previous award of the Comstock prize was made to Samuel Jackson Barnett in April, 1918, the next forthcoming award will be due in 1923, at which time the committee hopes to make suitable recommendations.

(2) That the treasurer of the academy states the available income from the fund to be $2,227.30.

For the committee.

EDWARD L. NICHOLS, *Chairman.*

Report received.

MURRAY FUND.

We are informed by the treasurer that the condition of the fund at present is as follows:

Invested capital	$6,000.00
Invested income	400.00
Uninvested income	1,036.77
	7,436.77

Owing to world conditions and the cessation during several years past of active oceanographic work, the committee is unable to advise that the medal be awarded this year, no conspicuous evidence of progress in oceanography being reported at present.

Very respectfully,

WM. H. DALL,
Chairman of the Committee.

Report received.

ELLIOT FUND.

The committee has unanimously voted the medal and honorarium for 1920 to Othenio Abel for his inspiring work, entitled "Methoden der paläobiologischen forschung."

HENRY FAIRFIELD OSBORN, *Chairman.*

Report received and recommendation approved.

MARY CLARK THOMPSON FUND.

Because of inadequate income, no award can be made of the Thompson medal this year.

JOHN M. CLARKE, *Chairman.*

Report received.

MARSH FUND.

Permit me to report for the Marsh fund committee the following grants which were read before the meeting of the academy on April 24 and approved by vote of the academy:

1. One hundred and fifty dollars to Dr. Carl O. Dunbar of Yale University for collection and study of Permian insects.

2. Seventy-five dollars to Miss Winifred Goldring of the State museum, Albany, N. Y. for investigation of the Devonian plants of Gaspe.

3. Three hundred dollars to Dr. W. J. Sinclair, of the department of geology of Princeton University, for continuation of his studies on the stratigraphic sucession of mammalian faunas of the White River Oligocene.

4. Two hundred dollars to Dr. Rudolf Ruedemann of the State museum, Albany, N. Y., for studies on the graptolites of North America.

5. One hundred and fifty dollars to Dr. F. Canu and Dr. R. S. Bassler, of the United States National Museum, for continuation of monographic studies on recent and fossil bryozoa.

6. Three hundred dollars to Dr. C. W. Gilmore, of the United States National Museum, for continued work on a monographic study of the fossil lizards of North America.

The grants approved by the academy total a sum of $1,175, there being available to the committee for this year the sum of $1,177.16.

J. C. MERRIAM, *Chairman.*

Report received and recommendations approved.

WASHINGTON, D. C., *May 5, 1922.*

Dr. C. G. ABBOT,

Home Secretary, National Academy of Sciences,

Smithsonian Institution, Washington, D. C.

MY DEAR DOCTOR ABBOT: In consideration of the policy of the Marsh fund committee relative to recommendation of grants, the committee unanimously approved the application of two principles for determination of its action in the future. I do not believe that these principles should be considered as rigid rules, but they are accepted as governing the action of the Marsh fund committee wherever possible. These definitions of policy are, first, to the effect that the committee requests of grantees under the Marsh fund, a report at the end of the year for which a grant is made, with the understanding that such report should give in general the progress made in the investigation, the statement being in such form that it may be filed as part of the record of the Marsh fund committee.

The second principle is in effect that extensions of grants for investigations supported by the academy through the Marsh fund may, in certain instances, be made for important work requiring continuous effort over a period longer than one year. It is, however, understood that, in general, such extension of grants will not be carried over a period longer than three years, and it is further understood that extension of grants beyond one year will not be considered unless satisfactory reports of advance in work are made before consideration is given to the question of continuation of the grant.

In making the report of the Marsh fund committee to the academy these principles were stated, but it is not my understanding that they were voted upon by the academy.

With best wishes, I am,

Very sincerely yours,

JOHN C. MERRIAM.

Approved.

GOULD FUND.

During the year the directors of the Gould fund have made two grants, one of $1,000 to Prof. Benjamin Boss for the support of the Astronomical Journal, and one of $150 to Dr. William Bowie for the support of the International Latitude Observatory, Ukiah, Calif.

The status of the Gould fund is as follows:

Invested capital	$19,822.50
Invested income	7,010.00
Total investments	26,832.50
Uninvested capital	177.50
Uninvested cash income	2,065.68
Total uninvested capital and income	2,243.18

F. R. MOULTON,
ROBERT S. WOODWARD,
Directors.

Report received.

JOSEPH HENRY FUND.

Acting for Dr. W. F. Durand, chairman of the Joseph Henry fund, permit me to report the following grants recommended to the National Academy:

1. The sum of $1,000 to Prof. Carl T. Compton, of the Palmer physical laboratory, Princeton, N. J., for researches on the electric moments of molecules.

2. The sum of $250 to Dr. H. J. Muller, of the University of Texas, for the purchase of a microscope especially designed for selective illumination of given cells or portions of cells by means of visible or ultraviolet light for use in studies in cytology, embryology, and genetics.

3. The sum of $500 to Dr. Ales Hrdlicka, of the United States National Museum, for support of investigations relating to the origin and antiquity of man on the American and Asiatic continents.

The total of the grants approved amounts to $1,750, there being available to the committee this year a total of $2,275.67. It is expected that consideration will be given to further grants from this fund after the return of Dr. W. F. Durand, and before the fall meeting of the academy.

J. C. MERRIAM, *Acting Chairman.*

Report received and recommendations approved.

RECOMMENDATIONS FROM THE COUNCIL.

The following recommendations from the council were adopted:

That the annual dues for the fiscal year July 1, 1922, to June 30, 1923, be $10, of which $5 shall be for the general fund and $5 for the Proceedings.

That the election of new members, and of the foreign secretary and two members of the council, be held Wednesday morning, April 26, 1922.

That the American Security & Trust Co., of Washington, D. C., and Spencer, Trask & Co., of New York, be designated fiscal advisers of the academy for the year 1922–23.

That the invitation of the New York members to hold the autumn meeting of 1922 in that city be accepted, and that the time be left to the president and home secretary with power.

That in view of the absence of Henry Norris Russell as a delegate of the academy to the meetings in Rome of the International Astronomical Union, the presentation to him of the Henry Draper medal, which has been awarded to him, be deferred until the autumn meeting.

That the following resignation of E. W. Morley as member of the Committee on Coinage, Weights, and Measures be accepted with regret and that the home secretary be directed to express to him the appreciation of the academy for his long and faithful service:

8 WESTLAND AVENUE, WEST HARTFORD, CONN.

Dr. T. C. MENDENHALL,
Chairman Committee on Weights, Measures, and Coinage,
National Academy of Sciences.

SIR: Since I am not likely to be able to attend meetings of the academy or of this committee, I hereby resign from membership in the committee.

Your obedient servant,

EDWARD W. MORLEY.

MARCH 30, 1922.

That the following resignation of C. L. Jackson as chairman and member accepted by the Committee on the Wolcott Gibbs Fund be received with regret and that the home secretary be directed to express to him the appreciation of the academy for his long and faithful service:

To the Directors of the Wolcott Gibbs Fund for Chemical Research.

GENTLEMEN: It is with great regret that I find myself obliged to resign my position as a member of your board, because I am no longer able to perform the duties connected with it.

Very respectfully,

CHARLES LORING JACKSON.

March 21, 1922.

SECTIONAL ORGANIZATION AND PERSONNEL.

The following resolution, presented by Henry Fairfield Osborn, was referred to the committee on nominations:

Whereas there are important omissions in the academy membership of men of international distinction: Be it therefore

Resolved, That the academy reconsider its present sectional organization and personnel.

ELECTIONS.

R. A. Millikan was reelected foreign secretary for the term expiring in 1926.

Messrs. Joseph S. Ames and Gano Dunn were elected members of the Council, their terms expiring in 1925, in succession to Messrs. John J. Carty and H. H. Donaldson.

Albert Einstein, of the University of Berlin, was elected a foreign associate.

The following were elected to membership:

Berry, Edward Wilber, Johns Hopkins University, Baltimore, Md.
Burgess, George Kimball, Bureau of Standards, Washington, D. C.
Cole, Rufus, Rockefeller Hospital, New York, N. Y.
Eisenhart, Luther Pfahler, Princeton University, Princeton, N. J.
Erlanger, Joseph, Washington University, St. Louis, Mo.
Hoover, Herbert, Secretary of Commerce, Washington, D. C.
Hulett, George Augustus, Princeton University, Princeton, N. J.
Kofoid, Charles Atwood, University of California, Berkeley, Calif.
Merrill, George Perkins, United States National Museum, Washington, D. C.
Seashore, Carl Emil, State University of Iowa, Iowa City, Iowa.
Stockard, Charles Rupert, Cornell University Medical School, New York, N. Y.
Swasey, Ambrose, 5701 Carnegie Avenue, Cleveland, Ohio.
Wright, William Hammond, Lick Observatory, Mount Hamilton, Calif.

The home secretary was requested to transmit the thanks of the academy to the Smithsonian Institution and to the Department of Agriculture for courtesies extended to its members during the annual meeting.

SCIENTIFIC SESSIONS.

MEETINGS OF APRIL 24, 25, AND 26, 1922.

MONDAY, APRIL 24.

C. D. Walcott: The new building of the National Academy and National Research Council (illustrated).

D. H. Campbell: Queries concerning the origin of the Australian floras.

L. R. Jones, J. G. Dickson, and J. C. Walker: Inquiries into the nature of disease resistance or immunity in certain plants (illustrated).

L. O. Howard: A side effect from the importation of parasites of injurious insects (illustrated).

E. L. Mark and L. C. Wyman: Mitochondrial bodies in the spermatogenesis of Chorthippus curtipennis (Scudd) (illustrated).

A. F. Blakeslee (introduced by C. B. Davenport): Vegetative types in Datura due to somatic number of chromosomes (illustrated).

W. G. MacCallum and E. H. Oppenhiemer: A method for the study of filterable viruses as applied to vaccinia.

Simon Flexner and H. L. Amoss: Continuation report on experiments in epidemiology (illustrated).

W. S. Halsted: Replantation of entire limbs without suture of blood vessels (illustrated).

H. F. Osborn and C. A. Reeds: Recent discoveries on the antiquity of man (illustrated).

A. Hrdlicka: Stature and head form in Americans of old families.

A. H. Clark (introduced by C. G. Abbot): Animal evolution.

F. M. Chapman: The distribution of the Motmots of the genus Momotus.

A. O. Leuschner: New results on the theory of the minor planets. (10 minutes.)

H. N. Russell: Dark nebulæ.

C. G. Abbot, F. E. Fowle, and L. B. Aldrich: The larger results of 20 years of solar radiation observations (illustrated).

H. A. Lorentz: Problems of modern physics.

TUESDAY, APRIL 25.

M. T. Bogert: Researches on thiazoles.

M. T. Bogert: Researches on selenium organic compounds.

M. Gomberg: Reaction between silver perchlorate and the halogens.

G. L. Wendt (introduced by W. A. Noyes): The thermal decomposition of tungsten (illustrated).

A. A. Noyes and H. A. Wilson: A confirmation of Saha's theory of the thermal ionization of elements at high temperatures.

W. D. Harkins: The general system of isotopes as related to the formation and disintegration of atom nuclei.

E. H. Hall: A theory of electric conduction in metals.

A. L. Day: Cooperative studies of California earth movements.

W. M. Davis: Geological overthrusts and underdrags.

J. F. Hayford: The effects of winds and barometric pressures on the Great Lakes (illustrated).

H. A. Brouwer (introduced by T. W. Vaughan): Striking similarities between igneous rocks of Brazil and South Africa (illustrated).

J. C. Merriam and Chester Stock: Fauna of the Pleistocene asphalt deposits of McKittrick, Calif. (illustrated).

F. B. Jewett: The telephone engineer a public trustee.

F. B. Jewett: The loud-speaking telephone (apparatus).

R. L. Wegel (introduced by J. J. Carty and F. B. Jewett): The physical examination of hearing and binaural aids for the deaf (apparatus).

Donald MacKenzie (introduced by J. J. Carty and F. B. Jewett): The relative sensitivity of the ear at different levels of loudness (illustrated).

J. S. Ames: Recent progress in aeronautics (illustrated).

R. A. Millikan: The coefficient of slip and the reflection of molecules (illustrated).

R. A. Millikan: The origin of penetrating radiations of the upper air (illustrated).

W. A. Shewhart (introduced by J. J. Carty and F. B. Jewett): On the measurement of a physical quantity whose magnitude is influenced at random by primary causes beyond the control of the observer, and on the method of determining the relation between two such quantities (illustrated).

D. C. Miller: Ether drift experiments at Mount Wilson in 1921 and at Cleveland in 1922 (illustrated).

R. S. Woodward: Some extensions in the mathematics of hydromechanics.

G. D. Birkhoff: Normal coordinates and Einstein space.

Edward Kasner: Algebraic solutions of Einstein's cosmological equations.

Oswald Veblen: The geometry of paths.

F. M. Chapman: Biographical memoir of Dr. J. A. Allen (by title).

G. C. Comstock: Biographical memoir of Benjamin Apthorp Gould (by title).

W. B. Cannon: Biographical memoir of Henry Pickering Bowditch (by title).

Frank Schlesinger: Catalogue of bright stars.

William M. Davis: Biographical memoir of Grove Karl Gilbert (by title).

H. F. Osborn: Biographical memoir of Edward Drinker Cope (by title).

Gustave Stromberg (introduced by G. E. Hale): The distribution of the velocities of stars of late types of spectrum.

W. S. Adams and A. H. Joy: A method of deriving the distance of the A-type stars.

G. E. Gibson and W. F. Giauque (introduced by G. N. Lewis): The entropy of supercooled and crystalline glycerin and the third law of thermodynamics.

D. D. Van Slyke and L. J. Henderson: Physico-chemical equilibria in the blood.

H. F. Osborn: Discovery of an anthropoid ape in western Nebraska, the first found in America.

A. P. Dachnowski (introduced by J. M. Coulter): A correlation of time units and climatic changes in peat deposits of the United States and Europe.

Oswald Veblen: A new form of the differential equations of gravitation.

PRESENTATION OF MEDALS.

Two medals were presented at the annual dinner, held at the Powhatan Hotel, Tuesday evening, April 25, 1922.

The J. Lawrence Smith medal was awarded to Dr. George Perkins Merrill, curator of geology at the United States National Museum. This is the first award of the J. Lawrence Smith medal since 1888. Dr. Whitman Cross, in stating the reasons for the presentation of the medal, pointed out that Dr. Merrill has continued to carry on the work of his predecessor, J. Lawrence Smith, on meteorites, by the application of modern methods of analysis, and that, at the same time, he has extended the list of elements and compounds that exist in these bodies. Doctor Merrill has also discovered evidences of metamorphism in meteorites, where a mineral structure has been broken up and the fragments later fused together similar to the conglomerates found in igneous rocks in the earth's crust. Doctor Merrill responded with a brief address.

In the presentation of the Daniel Giraud Elliot medal for the year 1921 to Dr. Othenio Abel, of the University of Vienna, Dr. Henry Fairfield Osborn outlined the difficulties under which the inspiring work, "Methoden der paläobiologischen Forschung," was produced by Doctor Abel. The medal was received by Dr. Edgar L. G. Prochnik, the chargé d'affaires of the Austrian Legation, for transmittal to Doctor Abel.

Further addresses were made by Dr. Vernon Kellogg, permanent secretary of the National Research Council; Dr. William H. Welch, past president of the academy; and Dr. Hendrik Anton Lorentz, of the University of Leyden, foreign associate of the academy.

REPORT OF THE NATIONAL RESEARCH COUNCIL FOR THE YEAR JULY 1, 1921–JUNE 30, 1922.

(Prepared by Vernon Kellogg, permanent secretary, with the assistance of the chairmen of divisions.)

INTRODUCTION.

For the benefit of those who may see for the first time in this annual report any statement concerning the organization and activities of the National Research Council, I reproduce here, with few changes, certain paragraphs first printed in the annual report of the council for the year 1920. These paragraphs relate to the general organization and methods of the council.

The National Research Council is a cooperative organization of the scientific men of America, including also a representation of men of affairs and business men interested in industry and engineering and in the fundamental or "pure" science on which the "applied" science used in these activities depends. The council enjoys the formal recognition and active cooperation of most of the major scientific and technical societies of the country, its membership being composed in large part of appointed representatives of these societies. Its essential purpose is the promotion of research in the physical and biological sciences and the encouragement of the application and dissemination of scientific knowledge for the benefit of the Nation.

The council is composed of a series of major divisions, one group of seven divisions of science and technology representing, respectively, physics, mathematics and astronomy; chemistry and chemical technology; anthropology and psychology; geology and geography; biology and agriculture; the medical sciences; and engineering; and another group of six divisions of general relations, representing foreign relations, Federal relations, States relations, educational relations, research extension, and research information. As subordinate or affiliated lesser groups, each of these divisions comprises a larger or smaller series of committees, each with its special problem or subject of attention. There are certain other committees, administrative and technical, which affiliate directly with the executive board of the council. Its general administrative officers are a chairman, three vice chairmen, permanent secretary, treasurer, and a chairman of each of the various divisions. All of these, except the permanent secretary and treasurer, are elected annually by the executive board or by the members of the divisions.

The council is neither a large operating scientific laboratory nor a repository of large funds to be given away to scattered scientific workers or institutions. It is rather an organization which while clearly recognizing the unique value of individual work, hopes especially to help bring together scattered work and workers and to assist in coordinating in some measure scientific attack in America on large problems in any and all lines of scientific activity, especially, perhaps, on those problems which depend for successful solution on the cooperation of several or many workers and laboratories, either within the realms of a single science or representing different realms in which various parts of a single problem may lie. It particularly intends not to duplicate or in the slightest degree to interfere with work already under way; to such work it only hopes to offer encouragement and support where needed and possible to be given. It hopes to help maintain the morale of devoted isolated investigators and to stimulate renewed effort among groups willing but halted by obstacles. It will try to encourage the interest of universities and colleges in research work and the training of research workers, so that the inspiration and fitting of American youth for scientific work may never fall so low as to threaten to interrupt the constantly needed output of well-trained and devoted scientific talent in the land. With any serious interruption in the output of American science and scientific workers, the strength of the Nation will be immediately threatened.

The methods of contributing practical assistance to American science in harmony with the general point of view and policy outlined above which the council has so far adopted are various. One is the establishment of special committees of carefully chosen experts for specific scientific subjects or problems urgently needing consideration, which plan modes of attack and undertake to find men and means (with the assistance of the general administrative offices of the council) for carrying out the plan. Another is the bringing together of industrial concerns interested in the development of the scientific basis of their processes and inducing them to support the establishment of special scientific investigations under the advice of experts representing the council. Another is the stimulation of larger industrial organizations, which may be in the situation to maintain their own independent laboratories, to see the advantage of contributing to the support of pure science in the universities and research institutes for the sake of increasing scientific knowledge and scientific personnel on which future progress in applied science absolutely depends. Other methods are the direct maintenance of university research fellowship; the publication of valuable scientific papers for which there is at present no other suitable prompt means of issuance; the preparation of bibliographies and abstracts of current scientific literature; the setting up of well-considered mechanisms

for the collection and distribution of information on current research, university and industrial research laboratories and facilities, research personnel, etc.; and the dissemination through the press and magazines of popular but authentic scientific news and information for the sake of increasing the public interest in and support of productive scientific work. Still other forms of activities might be listed, but those given adequately illustrate the council's methods.

RELATIONS TO THE NATIONAL ACADEMY OF SCIENCES.

The National Research Council was established in 1916 at the request of the President of the United States under the charter of the National Academy of Sciences. The existence of the council and its work was specially recognized by the President by an Executive order dated May 11, 1918, in which its institution by the Academy under its congressional charter was referred to, and the academy was requested by this order to perpetuate the council for the doing of certain duties specified in the order. In an opinion rendered by the Attorney General of the United States on January 29, 1920, the National Research Council was recognized as a special agency of the National Academy of Sciences for the accomplishment of certain particular purposes.

The funds derived by gift or otherwise for the use of the council are held by the academy and are paid out only on general or specific authorization of the academy. The treasurer of the academy is ex officio treasurer of the council and all checks made out by the bursar of the council are signed by an official of the academy and one of the council. The council participates on equal terms with the academy in the support and use of the Proceedings of the academy.

But the council has its own officers and membership and determines, under the general provisions of its founding by the academy, its own policies and activities.

RELATIONS TO THE ENGINEERING FOUNDATION.

The Engineering Foundation, established in 1914 by United Engineering Society, acting for the National Societies of Civil, Mining and Metallurgical, Mechanical, and Electrical Engineers, continues its intimate relations with the division of engineering, and is represented on the executive board. The Foundation contributes funds for the division of engineering and provides it with an office in Engineering Societies Building, 29 West Thirty-ninth Street, New York. In September, 1921, Engineering Foundation completed payment of its $30,000 grant for research in fatigue phenomena of metals. Since that time it has continued to act as treasurer for the equal fund being contributed by the General Electric Co. and to cooperate in other ways in the continuance of this research. Engi-

neering Foundation has cooperated with the division in other projects also and from time to time seeks advice from the division's consulting committees on projects of its own. The secretary of the foundation is chairman of the division of engineering.

FINANCIAL SUPPORT.

The major support for the general maintenance expenses of the National Research Council during the past year has come from the Carnegie Corporation of New York. The Corporation in March, 1919, expressed its readiness to appropriate $5,000,000 for the erection of a building for the joint use of the council and the National Academy of Sciences, and for an endowment for the council, provided a suitable site in Washington should be obtained from other sources and a satisfactory plan for the building should be presented.

A suitable site was obtained and the building is now in process of construction (see later paragraph on "New building"). In the meantime the corporation appropriated $185,000 for current expenses for the year July 1, 1921, to June 30, 1922.

The Rockefeller Foundation has during the year pledged itself to make two new considerable appropriations to the council for special purposes. One is the sum of $250,000, payable in amounts not to exceed $50,000 a year for five years, for the maintenance of advanced fellowships in medicine. A similar sum under similar conditions has been pledged by the General Education Board. This sum of $500,000, added to the $500,000 previously appropriated by the foundation for the maintenance through a five-year period of research fellowships in physics and chemistry, makes a total of $1,000,000 available to the council for fellowships. The other is the sum of $85,000 for the cleaning up of certain outstanding obligations of the Concilium Bibliographicum, an international institution for scientific bibliography, and for assisting in the maintenance of this institution for five years. The following amounts on these accounts and certain others have actually been received from the foundation by the council during the year: For research fellowships in physics and chemistry, $75,208.32; for fellowships in medicine, $231.85; for Concilium Bibliographicum, $30,000; for the division of physical sciences, $6,679.17.

From the General Education Board (already mentioned as having pledged $250,000 at the rate of $50,000 a year for five years for fellowships in medicine) have been received: For the division of educational relations, $2,500; for fellowships in medicine, $231.84.

From the Chemical Foundation: For special work on chemistry by the research information service, $7,500; for work on the standardization of biological stains, $500.

From various organizations, chiefly railroads, for the investigation of injuries to marine piling, $15,797.

From various organizations for the advisory board on highway research, $14,000.

From various organizations for the trustees for the publication of physical and chemical constants, $13,736.73.

Other contributions include: The sum of $2,000 from Julius Rosenwald toward the support of a fellowship in biology; from the Corning Glass Works toward the support of a fellowship in ceramics, $1,000; from the Southern Pine Association, for the use of the committee on forestry, $3,000; from various organizations, for the use of the food and nutrition committee, $1,350; from Glass Container Association of America, for an investigation of food products, $568.28; from various individuals, for international language, $950; from Theodore Lyman, special contribution toward the publication of Kayser's handbook on spectroscopy, $500; from various sources, for the committee on substitute deoxidizers, $400; for the use of the committee on atmosphere and man, $1,000; for expenses of chemical exhibits, $8,317.40; for motion-picture films, chemical exhibits, $1,500; for conference on sex research, $1,000; for national intelligence tests, $1,602.07.

NEW BUILDING.

In conformity with the provision made in connection with the appropriation by the Carnegie Corporation of New York, for the erection of a building for the joint use of the National Academy of Sciences and the National Research Council, a desirable site in Washington was obtained for approximately $185,000 by the generous gifts of the following donors: Thomas D. Jones, Harold F. McCormick, Julius Rosenwald, and Charles H. Swift, Chicago; Charles F. Brush, George W. Crile, John L. Severance, and Ambrose Swasey, Cleveland; Edward Dean Adams, Mrs. E. H. Harriman, and the Commonwealth Fund, New York City; George Eastman and Adolph Lomb, Rochester; E. A. Deeds and Charles F. Kettering, Dayton; Henry Ford, Detroit; Arthur H. Fleming, Pasadena; A. W. Mellon, Pittsburgh; Pierre S. du Pont, Wilmington; Raphael Pumpelly, Newport; Mr. and Mrs. H. E. Huntington, Los Angeles; Corning Glass Works, Corning, N. Y.

This site is the entire block between Twenty-first and Twenty-second and B and C Streets, almost directly opposite the Lincoln Memorial.

The building is now under construction and should be ready for occupancy in October, 1923. The architect is Mr. Bertram G. Goodhue, of New York City, and the general contractors are the C. T. Wills Co. (Inc.), of New York City. The Academy and Council

are confident that the new building will be of great architectural interest and beauty and admirably fitted for practical use.

OFFICERS FOR 1922–23.

At the meeting of the executive board on April 23, 1922, the following officers were elected for the year July 1, 1922, to June 30, 1923: Chairman of the executive board, John C. Merriam, president, Carnegie Institution of Washington; first vice chairman, Charles D. Walcott, secretary, Smithsonian Institution and president, National Academy of Sciences; second vice chairman, Gano Dunn, president of J. G. White Engineering Corporation, New York City; third vice chairman, R. A. Millikan, director, Norman Bridge Laboratory of Physics, California Institute of Technology, Pasadena, Calif. The honorary chairman, George E. Hale, director, Mount Wilson Observatory, Pasadena, Calif., and the permanent secretary, Vernon Kellogg, National Research Council; the treasurer, F. L. Ransome, of the United States Geological Survey and treasurer of the National Academy of Sciences, together with assistant secretaries Albert L. Barrows, National Research Council; Paul Brockett, assistant secretary, National Academy of Sciences, and Alfred D. Flinn, secretary, Engineering Foundation and chairman, division of engineering, National Research Council, continue in office without annual reelection.

INTERNATIONAL RELATIONS.

The council continues to maintain close relations with scientific interests and activities in other countries through its membership in the International Research Council and its representation in the various international unions affiliated with the International Research Council. It has been successful in arranging that the American dues to the International Research Council and affiliated unions should continue to be paid by the Government through the State Department.

Delegates accredited by the council attended the meetings in Rome in May, 1922, of the International Astronomical Union and the International Union of Geodesy and Geophysics, and in Lyons in June, 1922, of the International Union of Pure and Applied Chemistry. The council has also accredited delegates to the meeting of the International Research Council and the International Union of Scientific Radio-Telegraphy, both to be held at Brussels in July, and to the International Geological Congress to be held at Brussels in August.

By Article XXIV of the League of Nations there is authorized the establishment of a committee of 12 members to propose a plan for international cooperation in intellectual labor. The League has

established such a committee, and Dr. George E. Hale, honorary chairman of the council, was appointed member for America. The committee will hold its first meeting at Geneva in August, 1922.

During the past year and a half the council's committee on Pacific investigations has corresponded with countries and colonies within and bordering upon the Pacific Ocean with a view to the holding of a second pan-Pacific conference similar to that held in Honolulu in August, 1920. Recently the Commonwealth Government of Australia has made an appropriation to the Australian National Research Council, which will make it possible to hold this conference in Australia in the fall of 1923 under the immediate auspices of the Australian National Research Council.

PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES.

The council has continued to share in the editorial and financial responsibility of the Proceedings of the National Academy of Sciences. It has contributed during the year $2,500 to assist in meeting the expenses of the Proceedings, and has been represented on the managing and editorial boards by the following members of the council: Member of the executive committee, Vernon Kellogg; members of the editorial board, the chairman of the executive board and the permanent secretary and Messrs. Cottrell, Flinn, Gale, Jones, Mathews, Millikan, Ransome, Seashore, Vaughan, and Yerkes.

PUBLICATIONS.

From June 30, 1921 to July 1, 1922, 6,967 copies of the various issues in the bulletin series of the council and 10,376 copies of issues of the reprint and circular series were distributed. From the beginning to the present the total number of copies of bulletins distributed is 27,200 and of the reprints and circulars 30,842. The receipts for subscriptions to the bulletin and separate sales of bulletin and numbers in the reprint and circular series for the year totaled $1,751.68.

The following in each series have been issued or have gone to press since June 30, 1921:

BULLETIN OF THE NATIONAL RESEARCH COUNCIL.

VOLUME 2.

No. 13. The research activities of departments of the State government of California in relation to the movement for reorganization. By James R. Douglas. June, 1921. Pages, 46. Price, 60 cents.

No. 14. A general survey of the present status of the atomic structure problem. Report of the committee on atomic structure of the National Research Council. By David L. Webster and Leigh Page. July, 1921. Pages, 61. Price, 75 cents.

No. 15. A list of seismologic stations of the world. Compiled by Harry O. Wood. July, 1921. Pages, 142. Price, $2.

VOLUME 3.

No. 16. Research laboratories in industrial establishments of the United States, including consulting research laboratories. Originally compiled by Alfred D. Flinn; revised and enlarged by Ruth Cobb. December, 1921. Pages, 135. Price, $2.

No. 17. Scientific papers presented before the American Geophysical Union at its second annual meeting. February, 1922. Pages, 108. Price, $1.50.

No. 18. Theories of magnetism. By members of the committee on theories of magnetism. August, 1922. Pages, 261. Price, $3.

VOLUME 4.

No. 19. Celestial mechanics. Report of the committee on celestial mechanics of the National Research Council. (In press.)

No. 20. Secondary radiations produced by X-rays and some of their applications to physical problems. By Arthur H. Compton. (In press.)

No. 21. Electrodynamics of moving media. Report of the committee on electrodynamics of moving media. (In press.)

No. 22. The present status of visual science. By Leonard Thompson Troland. (In press.)

No. 23. Certain problems in acoustics. By members of the committee on acoustics of the National Research Council. (In press.)

No. 24. Algebraic numbers. Report of the committee on algebraic numbers of the National Research Council. (In press.)

No. 25. Celestial mechanics. Appendix to the report of the committee on celestial mechanics. (In press.)

No. 26. Report of the committee on luminescence. By members of the committee on luminescence. (In press.)

REPRINT AND CIRCULAR SERIES OF THE NATIONAL RESEARCH COUNCIL.

No. 13. Research problems in colloid chemistry. By Wilder D. Bancroft. June, 1921. Pages, 54. Price, 50 cents.

No. 15. Researches on modern brisant nitro explosives. By C. F. van Duin and B. C. Roeters van Lennep. Translated by Charles E. Munroe. October, 1921. Pages, 35. Price, 50 cents.

No. 18. Industrial benefits of research. By Charles L. Reese and A. J. Wadhams. August, 1921. Pages, 14. Price, 25 cents.

No. 19. The university and research. By Vernon Kellogg. August, 1921. Pages, 10. Price, 15 cents.

No. 20. Libraries in the District of Columbia. By W. I. Swanton. September 1921. Pages, 19. Price, 25 cents.

No. 21. Scientific abstracting. By Gordon S. Fulcher. December, 1921. Pages, 15. Price, 20 cents.

No. 22. The National Research Council. Its services for mining and metallurgy. By Alfred D. Flinn. November, 1921. Pages, 7. Price, 20 cents.

No. 23. American research chemicals. By Clarence J. West. September, 1921. Pages, 28. Price, 50 cents.

No. 24. Organomagnesium compounds in synthetic chemistry. A bibliography of the Grignard reaction, 1900–1921. By Clarence J. West and Henry Gilman. (In press.)

No. 25. A partial list of the publications of the National Research Council to January 1, 1922. February, 1922. Pages, 15. Price, 25 cents.

No. 26. Doctorates conferred in the sciences by American universities in 1921. Compiled by Callie Hull and Clarence J. West. March, 1922. Pages, 20. Price, 20 cents.

No. 27. List of manuscript bibliographies in geology and geography. By Homer P. Little. February, 1922. Pages, 17. Price, 25 cents.

No. 28. Investment in chemical education in the United States. Compiled by Callie Hull and Clarence J. West. March, 1922. Pages, 3. Price, 15 cents.

No. 29. Distribution of fellowships and scholarships between the arts and sciences. Compiled by Callie Hull and Clarence J. West. April, 1922. Pages, 5. Price, 15 cents.

No. 30. First report of the committee on contact catalysis. By Wilder D. Bancroft, chairman, in collaboration with the other members of the committee. (In press.)

No. 31. The status of "clinical" psychology. By F. L. Wells. January, 1922. Pages, 12. Price, 20 cents.

No. 32. Moments and stresses in slabs. By H. M. Westergaard and W. A. Slater. April, 1922. Pages, 124. Price, $1.

No. 33. Informational needs in science and technology. By Charles L. Reese. May, 1922. Pages, 10. Price, 20 cents.

No. 34. Indexing of scientific articles. By Gordon S. Fulcher. (In press.)

No. 35. American research chemicals. First revision. By Clarence J. West. May, 1922. Pages, 37. Price, 50 cents.

No. 36. List of manuscript bibliographies in chemistry and chemical technology. By Clarence J. West. (In press.)

No. 37. Recent geographical work in Europe. By W. L. G. Joerg. (In press.)

The council issued during the year the following miscellaneous publications:

Organization and members, 1921–22.

The executive committee on natural resources. By John M. Clarke, Henry S. Graves, and Barrington Moore. Reprinted from Science, N. S., volume 53, No. 1381, pages 550–552, June 17, 1921.

The obligation of the State toward scientific research. By James Rowland Angell. Reprinted from the Centennial Memorial Volume of Indiana University. July, 1921.

Science and national progress. Reprinted from Scientific American Monthly, July, 1921. What do you know about diatoms? By H. P. Little. A national information service for science and technology. By Ruth Cobb.

Science and national progress. Reprinted from Scientific American Monthly, August, 1921. Balloons, helium gas, and the age of the earth. By Homer P. Little.

A more definite statement of the highway research work. By W. K. Hatt. Reprinted from Automotive Industries, August 11, 1921.

The rôle of research in waste elimination. By Harrison E. Howe. From Chemical and Metallurgical Engineering, August 31, 1921.

Science and national progress. Reprinted from Scientific American Monthly, October, 1921. Topographic maps: What they are, who uses them, and how. By Homer P. Little.

Preservation of natural conditions. By the Ecological Society of America. Reprinted for the committee with the aid of the National Research Council. November, 1921.

A problem in the education of college students of superior ability. By George Walter Stewart. Reprinted from School and Society, November 19, 1921.

The National Research Council. By Vernon Kellogg. Reprinted from the Educational Review, volume 62, No. 5, December, 1921.

Geology as a profession. By H. P. Little. Reprinted from Science, N. S., volume 54, No. 1408, pages 619–622, December 23, 1921.

Zoological research as a career. By C. E. McClung. Reprinted from Science, N. S., volume 54, No. 1408, pages 617–619, December 23, 1921.

Research in the field of agriculture. By A. F. Woods. Reprinted from Science, January 20, 1922, volume 55, No. 1412.

Research in civil engineering as a career. By Alfred D. Flinn. Reprinted from Engineering News-Record, January 26, 1922.

Anthropology as a career. By Clark Wissler. Reprinted from the Indiana University Alumni Quarterly, January, 1922.

The research information service of the National Research Council, February, 1922.

Opportunities for a research career in medical science. By George W. McCoy. Reprinted from the Journal of the American Medical Association, February 18, 1922, volume 78, pages 533 and 534.

The field for chemists. By Wilder D. Bancroft. Reprinted from the Journal of Industrial and Engineering Chemistry, volume 14, No. 2, February, 1922.

Destruction of piling in water-front structures: Its prevention. By committee on marine piling investigations of the National Research Council, February, 1922.

The explosibility of ammonium nitrate. By Charles E. Munroe, chairman committee on the investigation of the explosibility of ammonium compounds, National Research Council. Reprinted from Chemical and Metallurgical Engineering, volume 26, No. 12, March 22, 1922.

Sectioning classes on the basis of ability. By C. E. Seashore. Reprinted from School and Society, April 1, 1922, volume 15, page 353.

Geography as a profession. By H. P. Little. Reprinted from Science, volume 55, No. 1423, April 7, 1922.

Psychology as a career. By C. E. Seashore. Reprinted from Science, volume 55, No. 1424, April 14, 1922.

FELLOWSHIPS.

The administration of scientific fellowships by the council has assumed very large proportions. In addition to $500,000, to be expended over a period of five years, provided by the Rockefeller Foundation as from the middle of 1919 for research fellowships in physics and chemistry, the council has now been intrusted with the administration of $500,000 more by the Rockefeller Foundation and General Education Board, acting jointly, for fellowships in medicine, and with $17,500 more from certain companies interested in chemical industry for fellowships in the relations of chemical products to agriculture.

There were on June 30, 1922, 18 fellowships in physics, 28 in chemistry, and 13 in medicine. The medical fellowships are administered, as are the fellowships in physics and chemistry, by a special board appointed by the council of men of recognized eminence in their scientific fields. The board for the medical fellowships is as follows: David L. Edsall, professor of medicine and dean of the medical school, Harvard University; Joseph Erlanger, professor of physiology, school of medicine, Washington University, St. Louis; G. Carl Huber, professor of anatomy and director of anatomic laboratory, University of Michigan; E. O. Jordan, professor of bacteriology, University of Chicago; Dean Lewis, professor of surgery, Rush Medical School, Chicago; W. G. MacCallum, professor of

pathology and bacteriology, Johns Hopkins University; Lafayette Mendel, professor of physiological chemistry, Yale University; W. W. Palmer, professor of medicine, Columbia University; and the chairman of the division of medical sciences of the National Research Council, chairman ex officio.

The board for the administration of the fellowships in physics and chemistry is as follows: Simon Flexner, chairman, director of research laboratories, Rockefeller Institute for Medical Research, Sixty-sixth Street and Avenue A, New York City; George E. Hale, director, Mount Wilson Observatory, Carnegie Institution of Washington, Pasadena, Calif.; John Johnston, Sterling professor of chemistry, Yale University, New Haven, Conn.; Elmer P. Kohler, professor of chemistry, Harvard University, Cambridge, Mass.; R. A. Millikan, director, Norman Bridge Laboratory of Physics, California Institute of Technology, Pasadena, Calif.; Augustus Trowbridge, professor of physics, Princeton University, Princeton, N. J. Ex officio: E. W. Washburn, chairman, division of chemistry and chemical technology, National Research Council; William Duane, chairman, division of physical sciences, National Research Council. Dr. W. E. Tisdale, secretary of the division of physical sciences, National Research Council, acts as executive secretary for the board.

The Texas Gulf Sulphur Co. has appropriated a sum of $10,000 for the support during the fiscal year 1922–23 of fellowships to be established under the division of biology and agriculture of the National Research Council for fundamental research in the agricultural applications of sulphur. In accepting the appropriation the National Research Council has reserved the right to publish, without restriction, the results obtained under these fellowships. The fellowships are administered by a special committee operating under the division of biology and agriculture.

A sum amounting to $2,000 annually has been made available during the 1920–21, 1921–22, and 1922–23 by Mr. Julius Rosenwald, of Chicago, for the purpose of developing scientific men among the Negro race in America. This fellowship has been awarded to Mr. E. E. Just, of Howard University, Washington, D. C.

FEDERATION OF BIOLOGICAL SOCIETIES.

An important movement to federate the American biological organizations which are of a research character and which are essentially national in scope (without destruction or constraining modification of the individual organizations) has been sponsored by the council. There are nearly a score of these national biological societies, with a total membership of over 6,000, almost wholly uncorrelated, yet the plain present tendency of work in biological science is toward a breaking down of the artificial boundaries thrown

up about each of the special fields of biology represented by these various societies. The students of genetics, for example, are equally interested in work done with plants and with animals.

To the end of developing a correlation among these societies an informal conference of representatives of the council's division of biology and agriculture and representatives of some of these leading societies and of the biological sections of the American Association for the Advancement of Science was held at Toronto in December, 1921 (at the time of the meetings of the American association and several of the biological societies), at which it was decided to hold later a formal conference. This second conference was held in the council's rooms in Washington in April, 1922. It was participated in by accredited representatives of 18 national biological societies, representatives of Sections F, G, N, and O of the American Association for the Advancement of Science and representatives of the council's division of biology and agriculture. A general agreement as to the high desirability of forming such federation of these various national agencies for the promotion of biological science was reached and an executive committee to draft a constitution and by-laws for the proposed federation appointed.

It was also agreed that perhaps the most important present special service the federation could serve was the promotion of more adequate means of publication than now exist and, especially, means of providing for a comprehensive biological abstracting journal. A special joint committee representing the division of biology and agriculture of the council on the one hand and the federation on the other was set up. This committee is to study the whole question of biological publications and report the results of its study, with recommendations for action.

CONCILIUM BIBLIOGRAPHICUM.

Representing both the council and the Rockefeller Foundation, the permanent secretary of the council made a detailed investigation in Zurich during the summer of 1921 of the status of the Concilium Bibliographicum, an organization founded and largely maintained by the activities of an American, Dr. Herbert Haviland Field, as an international institution of scientific bibliography. Because of the difficulties produced by the war and the later sudden death of Doctor Field in April, 1921, the Concilium, which had been performing a bibiliographic service of much usefulness to zoologists, anatomists, physiologists, and general biologists, found itself threatened with complete collapse. It had contracted debts for the payment of which no resources except its building, technical equipment, and stock of bibliographic cards were available. The use of these resources would have destroyed the institution.

As a result of the examination and report of the permanent secretary, the council adopted a plan for the rehabilitation of the Concilium, outlined in the report, which involved an arrangement as to control of the Concilium jointly by the council and the Swiss Society of Natural Sciences until some more widely representative international organization could take it over, and an appeal to the Rockefeller Foundation for an appropriation sufficient to clear off the outstanding obligations of the Concilium, return to the widow of Doctor Field a small part, at least, of the money advanced to the Concilium from Doctor Field's private funds, and assist in the current expenses of the institution during five years, at the end of which time it is hoped the Concilium may be self-sustaining or internationally subventioned.

In conformity with the recommendations of the council the Rockefeller Foundation has appropriated to the council $85,000 to be expended under the general direction of the council for the purposes above stated. Of this money, $15,000 is to meet the obligations already incurred by the council and the remainder ($70,000) is to be devoted to current expenses through five years.

By arrangement with the Swiss Society of Natural Sciences the immediate management of the Concilium is vested in a director, working under the general control of a joint commission consisting of one member, representing the Swiss society, and one representing the council. Dr. J. Strohl, of the University of Zurich, and formerly chief technical assistant in the Concilium, has been named as director and commission representative of the Swiss society and Vernon Kellogg as commission representative of the council. A special committee of the council on Concilium Bibliographicum matters has been appointed, with the following members: Vernon Kellogg, chairman; L. R. Jones, professor of plant pathology, University of Wisconsin; R. M. Yerkes, chairman, research information service, National Research Council; and J. R. Schramm, executive secretary, division of biology and agriculture, National Research Council.

In order that this committee and its representative on the joint managing commission might have competent advice as to the desires of American biologists and librarians, who constitute one-third of all the subscribers to the bibliographic cards issued by the Concilium, concerning the future activities of the Concilium, a conference of representative American biologists and librarians was held in the council rooms on April 24, 1922.

PERSONNEL RESEARCH FEDERATION.

The Personnel Research Federation, organized as a result of conferences held in the council's rooms in November, 1920, and March, 1921, held its first annual meeting in the council's rooms in

November 21, 1921. The meeting was well attended, rich in valuable papers, and stimulating in its discussions. A committee was appointed to act on a proposition for establishing a journal. An acceptable contract having been made with publishers and an editorial board created, the first issue of the monthly, The Journal of Personnel Research, appeared in May, 1922. Mr. Leonard Outhwaite is the editor in chief. Dr. Beardsley Ruml served the Federation as director from spring to fall of 1921; Mr. Outhwaite succeeded Dr. Ruml.

Without special effort, the Federation has made substantial gains in its membership, which now includes organizations engaged in personnel research, universities, governmental departments, the American Federation of Labor, and individuals.

The officers of the Personnel Research Federation are: Chairman, Robert M. Yerkes; vice chairman, Samuel Gompers; secretary, Alfred D. Flinn; treasurer, Robert W. Bruere.

At the annual meeting the chairman in his address outlined the purposes of personnel activities and research and spoke of changes in work and workers resulting therefrom as industry developed. Other papers were:

"Basic experiments in vocational guidance," C. S. Yoakum; "An experimental study on retardation in relation to satisfaction on the job in a metal manufacturing plant," Joseph W. Hayes; "Methods and results in selection of students for engineering training," L. L. Thurstone; "Posture in occupations as related to health," L. R. Thompson; "Determination of carbon monoxide in the blood and its effects on the worker," R. R. Sayers; "Problems of personnel research of interest to organized labor," Samuel Gompers; "Difficulties encountered in a cause-of-leaving research," Miss Anna Bezanson.

The office of the Federation is in the Engineering Societies Building, 29 West Thirty-ninth Street, New York, by courtesy of the Engineering Foundation.

SCIENCE SERVICE.

Science Service, established in April, 1921, under the joint auspices of the council, the National Academy of Sciences, and the American Association for the Advancement of Science, has made rapid progress in its work in the popularization of science. It has been aided by an annual subvention of $30,000 from Mr. E. W. Scripps, of Cincinnati, Ohio, and has had during the past year an income from sales of its scientific articles and news notes of about $20,000 for the same year.

It maintains a weekly (soon to be converted into a daily) Science News Bulletin which is subscribed for by about 40 newspapers, mostly of large circulation, and a special feature service subscribed for by a similar number of newspapers. It has provided, during the year, numerous articles, long and short, for standard magazines, has

arranged for the publication of a number of popular scientific books, has issued a motion picture on a timely scientific subject, and has, especially in the person of its editor, Dr. E. E. Slosson, provided numerous popular scientific lectures. Science Service is helping fill the need in America of a means of disseminating authentic scientific information and news in understandable and interesting form.

AMERICAN SCIENTIFIC LITERATURE FOR RUSSIAN SCIENTIFIC INSTITUTIONS.

An American committee to aid Russian scientists consisting of Vernon Kellogg, chairman; and Messrs. L. O. Howard, Chief, United States Bureau of Entomology; David White, Chief Geologist, United States Geological Survey; and Raphael Zon, forest economist, United States Forest Service, all members of the council, but not acting as an official council committee, was formed in the spring of 1922. This committee issued an appeal to American scientific men, organizations, and publishing houses for gifts of American scientific books, journals, and papers issued since January 1, 1915, to be distributed free to Russian universities and investigators, who had received practically no American scientific publications issued since the beginning of the war.

The committee was able to arrange for the generous cooperation with it of the American Relief Administration, under the chairmanship of Hon. Herbert Hoover, which offered to undertake the receipt and proper packing in New York of all material contributed and to provide for the free transportation of the material overseas and into Russia (Moscow). The administration also gave the use of the services of its American agents scattered through Russia to help assure a safe and proper distribution of the material sent over. A special Russian committee of eminent scientific men, principal universities, the academy of science, and other major scientific organizations was set up in Moscow to assist in the distribution.

A widespread and generous response was made by American Government and State scientific bureaus, experiment stations, scientific societies, university presses, and other publishers of scientific books and journals and by individuals to the appeal of the committee, which has enabled the committee to collect and send to Moscow, about twelve tons of scientific books, journals, and papers, all issued since January 1, 1915, and, mostly, of undoubted value to Russian scientific investigators and teachers.

REPORTS OF DIVISIONS.

DIVISION OF FEDERAL RELATIONS.

[CHARLES D. WALCOTT, Chairman.]

(For list of members see Appendix A.)

The activities of the division of Federal relations during the past year have been chiefly confined to those of the committee on scope of Government service. Because of the resignation of Dr. C. L. Alsberg, chairman of this committee, from the United States Bureau of Chemistry and his removal to California and consequent resignation of the chairmanship of the committee, Dr. H. Foster Bain, Director of the Bureau of Mines, was made chairman in his stead. A report by this committee is under process of preparation. Dr. Bain has held numerous conferences with various representatives of Government scientific bureaus in connection with the preparation of this report.

The division as it stands has as members representatives from Government departments and bureaus as follows:

Department of State: Consular Service.
Department of Treasury: Public Health Service.
Department of War:
- General Staff.
- Military Intelligence Division.
- Coast Artillery.
- Medical Corps.
- Engineer Corps.
- Ordnance Department.
- Signal Corps.
- Air Service.
- Chemical Warfare Service.

Department of Justice.
Post Office Department.
Department of Navy:
- Intelligence Division.
- Bureau of Navigation.
- Bureau of Yards and Docks.
- Bureau of Ordnance.
- Bureau of Construction and Repair.
- Bureau of Steam Engineering.
- Bureau of Medicine and Surgery.

Department of the Interior:
- Patent Office.
- Geological Survey.
- Reclamation Service.
- Bureau of Education.
- Bureau of Mines.

Department of Agriculture:
- Weather Bureau.
- Forest Service.

Department of Agriculture—Continued.
Bureau of Animal Industry.
Bureau of Plant Industry.
Bureau of Chemistry.
Bureau of Soils.
Bureau of Entomology.
Bureau of Biological Survey.
Bureau of Public Roads.
Department of Labor: Bureau of Labor Statistics.
Department of Commerce:
Coast and Geodetic Survey.
Bureau of Standards.
Bureau of Fisheries.
Bureau of the Census.
Bureau of Lighthouses.
Smithsonian Institution.

DIVISION OF FOREIGN RELATIONS.

[R. A. MILLIKAN, Chairman.]

(For list of members, see Appendix A.)

The annual meeting of the division was held in Washington on April 21, 1922. At this meeting reports were presented from the American sections of the following international scientific organizations with which the council has affiliations by representatives of these sections as named:

International Astronomical Union: Joel Stebbins, professor of astronomy, University of Illinois.

American Geophysical Union: W. J. Humphreys, professor of meteorological physics, United States Weather Bureau.

International Union of Pure and Applied Chemistry: F. G. Cottrell, chairman, division of chemistry and chemical technology, National Research Council.

International Mathematical Union: L. E. Dickson, professor of mathematics, University of Chicago.

International Union of Scientific Radio-Telegraphy: L. W. Austin, head of United States Naval Radio Research Laboratory.

International Bureau of Weights and Measures: S. W. Stratton, Director, United States Bureau of Standards.

International Commission on Illumination: E. P. Hyde, director, Nela Research Laboratory, General Electric Co., Cleveland, Ohio.

International Electro-Technical Commission: C. O. Mailloux, president, United States National Committee, 111 Fifth Avenue, New York.

DELEGATES TO 1922 MEETINGS OF INTERNATIONAL RESEARCH COUNCIL AND AFFILIATED UNIONS.

The following delegates were accredited by the council to meetings, as indicated, of the International Research Council and affiliated unions, as follows:

INTERNATIONAL RESEARCH COUNCIL, BRUSSELS, JULY 25.

James H. Breasted, professor of Egyptology and oriental history, University of Chicago.

George E. Hale, director, Mount Wilson Observatory, Pasadena.

Robert A. Millikan, director, Norman Bridge laboratory of physics, California Institute of Technology.

Augustus Trowbridge, professor of physics, Princeton University.

INTERNATIONAL ASTRONOMICAL UNION, ROME, MAY 2.

R. G. Aitken, astronomer, Lick Observatory, University of California.

L. A. Bauer, director, Department of Terrestrial Magnetism, Carnegie Institution of Washington.

William Bowie, chief, division of geodesy, United States Coast and Geodetic Survey.

H. D. Curtis, director, Allegheny Observatory, University of Pittsburgh.

Edward Kasner, professor of mathematics, Columbia University.

O. J. Lee, astronomer, Yerkes Observatory, University of Chicago.

Frank B. Littell, astronomer, United States Naval Observatory.

Henry N. Russell, professor of astronomy and director of observatory, Princeton University.

John A. Miller, director, Sproul Observatory, Swarthmore College.

C. E. St. John, astronomer, Mount Wilson Observatory.

Frank Schlesinger, director of observatory, Yale University.

F. H. Seares, astronomer, Mount Wilson Observatory.

Harlow Shapley, astronomer, Harvard College Observatory.

INTERNATIONAL GEODETIC AND GEOPHYSICAL UNION, ROME, MAY 2.

L. A. Bauer, director, department of terrestrial magnetism, Carnegie Institution of Washington.

William Bowie, chief, division of geodesy, United States Coast and Geodetic Survey.

H. H. Kimball, meteorologist, United States Weather Bureau .

G. W. Littlehales, hydrographic engineer, United States Hydrographic Office.

Harry Fielding Reid, professor of dynamical geology and geography, Johns Hopkins University.

Frank Schlesinger, director of observatory, Yale University.

H. S. Washington, petrologist, Geophysical Laboratory, Carnegie Institution of Washington.

INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY, LYONS, JUNE 28.

Edward Bartow, head department of chemistry, University of Iowa.

E. S. Chapin, American representative, Textile Alliance, Paris.

R. B. Moore, chief chemist, United States Bureau of Mines.

Charles L. Parsons, secretary, American Chemical Society.

E. W. Washburn, professor of ceramic engineering, University of Illinois.

H. S. Washington, petrologist, Geophysical Laboratory, Carnegie Institution of Washington.

INTERNATIONAL UNION OF SCIENTIFIC RADIO-TELEGRAPHY, BRUSSELS, JULY 24.

E. F. W. Alexanderson, General Electric Co.

L. W. Austin, head of United States Naval Radio Research Laboratory.

A. E. Kennelly, professor of electrical engineering, Harvard University.

INTERNATIONAL GEOLOGICAL CONGRESS, BRUSSELS, AUGUST 10.

E. B. Mathews, professor of mineralogy and petrography, Johns Hopkins University.

The council made appropriations amounting in all to $3,100 to assist in the payment of travel expenses of the delegates accredited by it to the various international meetings.

International dues.—By an appropriation in the Diplomatic and Consular bill funds were made available for the payment of 1921 dues to the following international organizations:

International Research Council	$129
International Union of Pure and Applied Chemistry	290
International Astronomical Union	772
International Union of Geodesy and Geophysics	1,338
International Mathematical Union	129

These dues are payable in francs, and appropriation in dollars was based on the rate of exchange current at the time of the drawing of the bill. By the time, however, that the money could be remitted by the State Department to meet these dues, the exchange value of the franc against the dollar had increased, and the Government appropriation in dollars was unable to meet the full payments in francs. This deficit amounted altogether to $463.37, which was paid by the council. In the bill providing for the appropriation for 1922 dues the value of the franc was calculated at an advanced rate, and it is expected that little, if any, deficit will occur in the appropriation in dollars for meeting these dues.

International station at Ukiah for variation of latitude.—A deficiency appropriation of $2,000 was secured from the Government through the good offices of the Department of State with which to meet the expenses of the international station at Ukiah for the fiscal year ending June 30, 1922. It will also probably be possible to repay from this sum certain grants which were made from special funds of the National Academy of Sciences and the National Research Council in order to carry the expenses of this station over an emergency period in 1921.

A second item of $2,000 for this same account has been made in the State Department's regular appropriation bill for 1922–23. It is expected that by the middle of 1923 arrangements will be made for the transfer of the property of this international station to American auspices and for continuation of the program of this station in cooperation with stations in Japan and Italy.

DIVISION OF STATES RELATIONS.

[JOHN C. MERRIAM, Chairman.]

(For list of members, see Appendix A.)

The annual meeting of the division was held in Washington May 23, 1922. The following papers were presented:

The present status of forestry under State auspices, and the problem of the organization of science under State control: H. S. Graves, dean, School of Forestry, Yale University.

The present status of research in State geological surveys: E. B. Mathews, professor of mineralogy and petrography, Johns Hopkins University.

Cooperation in research under public agencies: E. W. Allen, Division of States Relations, Department of Agriculture.

Summarization of report upon survey of scientific work in Illinois: Leonard D. White, associate professor of political science, University of Chicago.

Fundamental considerations affecting the relation of research to public administration: John C. Merriam, president, Carnegie Institution of Washington.

Illinois survey.—An elaborate report was submitted by Dr. Leonard D. White, associate professor of political science, University of Chicago, upon "The organization and activities of the scientific departments of the State government of Illinois." This report is the second—the first was on California—in a series of similar reports for which the division has arranged. The purpose of these reports is to disclose the conditions at present surrounding the position of scientific research in governmental agencies and the place which research ought to occupy in public administration. It is planned to publish soon the greater part of this Illinois report.

Report of Government scientific work in cooperation with non-Federal agencies.—A report upon this subject has been drafted by Dr. E. W. Allen, which it is planned to publish.

Report of California committee on scientific research of the California State council of defense.—The final report, dated January 31, 1919, has been revised and its publication authorized by the secretary of state of California. The council believes that this will be a useful paper for it to publish in view of the unique character of the organization of this committee and of the effectiveness of its work.

Conditions surrounding geological research under State auspices.—At the request of the division of states relations the division of geology and geography undertook to prepare a report upon the conditions surrounding geological research under State auspices. This report was presented at the annual meeting of the division.

Study of conditions in State forest services.—Dean Graves, chairman-elect of the division, has undertaken to make an extensive personal study of the conditions in State forest services and at the same time to give attention to research possibilities in forestry and conditions surrounding research in this field under State auspices. To make

this study Dean Graves has undertaken to visit many of the States of the Union.

Study of centralization in State government.—The major undertaking of the division for the coming year will be a study of the tendency toward the centralization of government and its effect upon the freedom for research in State educational and scientific institutions. This study will begin probably in the States of Massachusetts and Maryland and will then be extended to Wisconsin and Illinois.

DIVISION OF EDUCATIONAL RELATIONS.

[VERNON KELLOGG, Chairman.]

(For list of members, see Appendix A.)

The annual meeting of the division was held in Washington on April 19, 1922. The period of the meeting was mostly given over to a discussion of the problem presented by the gifted student in the colleges and universities and of the ways and means for prosecuting work on this problem. The chairman stated that the principal activities of the division during the year had related to this problem, and proposed that the division, in continued collaboration with the division of anthropology and psychology, should continue to give special attention to this problem during the coming year. After some discussion of ways and means of carrying on the work this proposal was adopted.

Special conference on problem of the gifted student.—On December 23, 1921, a special conference on the problem of the gifted student was held in the council's rooms at Washington, in which invited representatives—presidents, deans, and professors—of about a dozen colleges and universities participated. A report of this conference, with abstracts of the prepared papers and of the general discussion, was given wide circulation among the colleges and universities of the country and attracted much favorable attention. It was the unanimous opinion and recommendation of this conference that the council, through its divisions of educational relations and anthropology and psychology, should continue to keep this problem before college and university administrators and faculties, both by correspondence, the issuance of bulletins and pamphlets, and by personal visits by representatives of the council.

"Open letter to college seniors" and "career bulletins."—In response to many suggestions the division arranged for the preparation by Dean Seashore, of the University of Iowa, and publication of an "Open letter to college seniors," calling attention to the opportunities afforded the senior class men and women of superior mental endowment for a career of scholarships. This "Open letter" met from the beginning of its distribution with such a favorable reception that repeated printings were necessary to supply the demand first made

on the division by university and college presidents and deans. About 15,000 copies have been sent on this personal demand.

In addition arrangements have been made for the preparation by competent authorities—in most cases the chairmen of the council's divisions of science and technology—for special "career bulletins," calling the attention of university students to the opportunities for research careers on the part of competent men and women, in each of the principal fields of scientific work. Such bulletins have so far been prepared and published for the fields of agriculture, anthropology, chemistry, civil engineering, geography, geology, medicine, psychology, and zoology. Other bulletins are now in course of preparation.

Honors systems.—As a result of the consideration by the conference of December 23, 1921, of the advantages of the development of some form or forms of honors systems in American colleges and universities a special committee, consisting of President Aydelotte, of Swarthmore College, and the chairman of the division, was appointed to collect information concerning the extent to which honors systems are now in vogue in this country and the character of the various systems adopted and to prepare a report on the basis of this information for general circulation among college and university administrators and faculties. The work of collecting the information is practically completed and the report in course of preparation.

Assistance to committee G, on methods of increasing the intellectual interest and raising the intellectual standards of undergraduates of the American Association of University Professors.—Under the chairmanship of Prof. E. H. Wilkins, of the University of Chicago, committee G, on methods of increasing the intellectual interest and raising the intellectual standards of undergraduates of the American Association of University Professors, is attempting to prepare a full bibliography of books and articles referring to the general subject of the committee's interests. Part of the bibliographic work of the committee covers the special subject of the problem of the gifted student, and the division has made an appropriation of $500 to assist the committee in its work as far as it applies especially to the gifted-student problem. The work of the committee is now being actively prosecuted.

Report on research conditions in American colleges and universities.—As a result of the work done by the division (with the financial support of the General Education Board) during the last two years on an investigation of the research situation in the colleges and universities of the country, which included personal visits to about 200 institutions by representatives of the division, there is now on hand a large amount of informative material in the shape of reports from college and university authorities and reports of the visitors. The chairman of the division hopes to complete a general report on the subject, suitable for publication, during the coming year.

DIVISION OF RESEARCH EXTENSION.

[H. E. Howe, Chairman.]

(For list of members, see Appendix A.)

The annual meeting of the division was held in Washington on April 22, 1922.

The division of research extension in addition to developing certain projects peculiarly its own has, through its chairman and secretary, aided actively in the promotion of certain projects of other divisions, especially such as require financial support from outside sources. Among these may be mentioned the projects in charge of the committees on atmosphere and man, standardization of biological stains, vestibular research, marine piling investigations, food and nutrition, etc. All work in connection with the finding of funds from industrial concerns for the support of scientific investigation has been made very difficult and slow during the year by the unsettled financial and industrial condition of the country.

Committee on corrosion.—Progress in the work of the division's committee on corrosion has been made in the way of bibliographic work, and the preparation of a monographic review of the present status of corrosion investigation. A large corporation has, at the suggestion of the committee, placed a special investigator on corrosion work.

Alloys research information service.—Little advance has been made during the past year on this project, as the time does not seem yet ripe in the industrial world for the securing of definite contracts for the support of the work. On the other hand, there is almost universal approval of the idea and plan, and with the coming of better financial conditions the support necessary for the development of the work of the service should not be difficult to obtain.

Tanning research institute and school.—A report, making certain recommendations, on the subject of establishing a research institute or laboratory to prosecute scientific investigations of problems in tanning, and the creation of a special tanning school has been made and accepted by the Tanners' Council. A research laboratory in Cincinnati is now active, and it is expected that the Tanners' Council will take full action in connection with the recommendations embodied in the report.

National Textile Institute.—The effort to establish a national Textile institute has met with little success so far because of the present impossibility of obtaining the large funds necessary to its support. Nevertheless some progress has been made in enlisting the interest and approval of various organizations. The Bureau of Standards has begun a research program in connection with textiles, and a committee composed of representatives of the council, the Bureau of

Standards, the American Home Economics Association (especially representing the consumers) and various associations of textile manufacturers is being organized.

National Institute of Nutrition.—In connection with the efforts of the division of biology and agriculture and the division of research extension, a report similar to that on National Textile Institute must be made. The necessarily large funds needed for the support of such an institute have not been found, although certain encouraging assurances of assistance have been secured.

Crop Protection Institute and Horological Institute.—These two organizations, which were initiated and sponsored by the division, are now well established and actively at work.

The annual meeting of the Crop Protection Institute was held in Rochester on January 12, 1922. The membership of the institute now comprises 256 scientific members, 25 industrial concern members, and 21 associate industrial members. Various funds are now in the hands of the institute for the prosecution of particular investigations.

The present membership of the Horological Institute of America is as follows: Patrons 2; life members, 20; sustaining members, 32; active members, 97. There is about $4,000 in the treasury.

RESEARCH INFORMATION SERVICE.

[Robert M. Yerkes, Chairman.]

(For list of members, see Appendix A.)

The annual meeting was held in Washington, April 10, 1922. A report of the year's work was presented by the chairman and the matter of the further development and extension of the Service and its establishment on a secure and sufficient financial basis was discussed at length. There was general approval of the idea of expanding the Service to an extent sufficient to make it a nationally useful clearing house for information in science and technology. It was estimated that to enable the Service to develop in such a way as to meet satisfactorily such a conception of it would require an annual expenditure on its part of at least $50,000 a year for the next few years and $100,000 a year thereafter. It was considered probable, however, that part of this income could be provided by the Service itself from subscriptions for its services.

Staff.—The present staff provides the services of a chairman and a number of scientific associates, technical assistants, clerks, and stenographers. However, a part of the time of all the members of the staff is taken up by duties connected with the council's publications and other activities so that the actual staff services at present available to the Service may be estimated as follows: Chairman,

one-half time; scientific associates, equivalent to three on full time; technical assistants, equivalent to three on full time; clerks and stenographers, equivalent to six on full time.

Miscellaneous request service.—During the year nearly 2,000 requests for scientific information were answered, and in addition a large number of intramural requests were cared for. The requests are almost equally divided between science and technology. The degree of satisfactoriness of the replies to the recipients is indicated by the following tabulation of expressions on the part of the questioners: Seventy-two per cent satisfactory information or reference; 25 per cent incomplete but useful replies; 3 per cent "no new information;" slightly less than 1 per cent "unsatisfactory." It seems clear that the miscellaneous request service is worth fostering, especially if the larger plans for the extension of the informational work of the Service can be realized.

Development of informational machinery.—The personnel file of persons now engaged in this country in scientific and technologic investigation has grown rapidly. It now contains reasonably complete and up to date records for about 14,000 such persons. This entire file is in process of "findexing," which, because of the preparation of codes for the several sciences and branches of technology and preparation of the findex cards, is a very large undertaking. The findexing of the records for chemists, physicists, and psychologists is already completed. The value and use of this file is indicated by the fact that between one-fourth and one-third of all the miscellaneous requests for information are answered partially or wholly by reference to this file.

Research laboratories file.—A resurvey of American industrial research laboratories and of their personnel was completed during the year and a revised bulletin listing them and giving information concerning their extent, character, and personnel published. It has been the most called-for bulletin issued by the Service. The file is being constantly supplemented and kept up to date.

Library of reference and source books.—About 200 volumes were accessioned during the year at a cost of about $1,000. More money, at least $2,500 a year, is needed for the proper maintenance of this library.

Bibliographic file and section.—In collaboration with other divisions of the council, and with individual specialists in various parts of the country, the Service has arranged for the compilation of lists of both published and unpublished manuscripts in science and technology. A list of manuscript bibliographies for geology and geography has already been published, and similar lists for chemistry, physics, and mathematics are in press; others are in course of preparation. Lists of published bibliographies for geology, physics, chemistry, astron-

omy, and mathematics are well advanced and will be completed and published during the coming year. Altogether the progress of this important part of the Service's informational machinery has been rapid and substantial and the promise of usefulness through it is great, for there is no more serious wastage of investigators' time than in duplication of search and listing of references.

Special survey of informational sources of the world.—The Service in connection with the consideration of a possible future considerable extension of the scope of its work, arranged with Mr. J. David Thompson, an expert investigator, to make a special survey of the informational sources of the world, in order that the Service and the council might have before them during their consideration of the future development of the service a needed collection of data concerning other important informational organizations. Mr. Thompson's survey was conducted promptly in consultation with officers and members of the Service and with various specialists in Washington and New York. The survey was made use of by Messrs. Yerkes (chairman of the service) and Flinn (chairman of the division of engineering) in connection with their work of drawing up a plan for the further development and expansion of the service. This plan, approved by formal action of the service, was presented to the executive board of the council at its meeting on April 26, 1922, and referred to a special committee appointed to consider it and report back to the board.

Informational publications.—Much of the work undertaken by the Service on special request, or in the development of its informational aids, results in the compilation of scientific information which is worthy of special circulation by publication. Indeed, issuance of informational bulletins and circulars would appear to be one of the important special functions of the Service.

The following are publications issued by the council during the year for which the Service is partly or wholly responsible:

Libraries in the District of Columbia; Scientific Abstracting, being a description of methods, by Gordon S. Fulcher; American Research Chemicals, a list of commercial sources; Organomagnesium Compounds in Synthetic Chemistry, a bibliography of the Grignard reaction, 1900–1921; A partial list of Publications of the National Research Council to January 1, 1922; Doctorates Conferred in the Sciences by American Universities in 1921; Distribution of Graduate Fellowships and Scholarships between the Arts and Sciences; Investment in Chemical Education in the United States; Informational Needs in Science and Technology; A List of Seismological Stations of the World; Research Laboratories in Industrial Establishments of the United States, Including Consulting Research Laboratories, second edition, revised and enlarged.

Public announcements concerning the service.—A card announcement of Research Information Service was printed in an edition of 5,000 copies and distributed to libraries and similar institutions for use on bulletin board. A brief description of the Service was printed as

12-page folder in an edition of 15,000 copies. This has been supplied to chairmen of divisions of the council and is being distributed principally in connection with letters.

Four news announcements relative to special activities of the service have been sent to scientific and technological publications. Free advertising space, full page or half page, has been secured irregularly in Journal of American Optical Society. One-half page advertising space has been purchased in Science for six issues, only one of which has appeared.

The purposes and plans of the Information Service have been presented by members of the staff in addresses or demonstrations before some 15 scientific and technological audiences.

Examples of special projects and requests cared for by the service.—The service is frequently asked to render services which require relatively large expenditure of time. Whenever practicable the response is favorable. The following list of special projects indicates the variety and extent of demand. Such tasks as those mentioned use not far from one-fourth of the time of the staff:

Survey of students in chemistry and expenditure for chemical instruction and research in American institutions, for Chemical Foundation.

List of research chemicals manufactured in the United States, for American chemists.

List of American laboratories well supplied with chemical periodicals and check list of chemical publications in same, for American chemists.

Revision and supplementation of council's list of periodical bibliographies and abstracts of the world, for publication.

Compilation of list of doctorates conferred in 1920–21 by American institutions, for publication, and supplementation of personnel file.

Compilation of bibliography on corrosion, for division of research extension.

Union list of periodicals in the District of Columbia, as a local service.

Compilation of a bibliography of chemical warfare, for American chemists.

Preparation of list of scientific instruments and other equipment available for loan or exchange, for American investigators.

Survey of published and unpublished lists of genera and species, for division of biology and agriculture.

Survey of current interest and investigations in problems of sex, for division of medical sciences.

Statistical study of distribution of research interest and activity in psychology, for American psychologists.

Cooperation with Personnel Research Federation by supplying information.

Cooperation with division of engineering in conducting survey of highway research.

Promotion of abstracting and listing of scientific and technological literature through preparation of reports, conference, and plans for abstracting.

A survey of sources of funds for support and encouragement of research, for publication.

Compilation of mental and educational tests for division of anthropology and psychology.

Survey of seismological stations of the world in cooperation with geophysical union.

DIVISION OF PHYSICAL SCIENCES.

[H. G. GALE, Chairman.]

(For list of members, see Appendix A.)

For the year beginning July 1, 1921, the division elected to operate with a part-time chairman and a full-time executive secretary. Dr. W. E. Tisdale was selected to act in this latter capacity.

The annual meeting of the division was held in Washington on April 23, 1922. At this meeting the division approved the plan for the continuance of the activities of special committees as the most effective arrangement for promoting the interests of the division. As the special appropriation from the Rockefeller Foundation which had been available for the support of these committees during the years 1919–20 and 1920–21 was exhausted on June 30, 1922, a special appropriation of $5,000 was made by the council for the support of these committees during the year 1922–23.

Reports of special committees.—The division has completed reports which have been published in the bulletin series of the council, as follows:

Bulletin No. 5. The quantum theory, by E. P. Adams.

Bulletin No. 6. Data relating to X-ray spectra, by William Duane.

Bulletin No. 7. Intensity of emission of X-rays and their reflection from crystals, by Bergen Davis; and problems of X-ray emission, by D. L. Webster.

Bulletin No. 10. Report on photoelectricity, by A. Ll. Hughes.

Bulletin No. 14. A general survey of the present status of the atomic structure problem, by D. L. Webster and Leigh Page.

There is now in press manuscript for further bulletins representing the work of the following: Committees on acoustics; algebraic numbers; celestial mechanics; celestial mechanics, part II; luminescence; mathematical analysis of statistics; physiological optics; theories of magnetism; X-ray spectra.

The chairmen of all the special committees operating under the appropriation from the Rockefeller Foundation have made final accounting of their expenditures and have returned to the bursar of the National Research Council all the moneys held by them under this appropriation.

Revolving fund for mathematical publications.—The division has secured an appropriation from the council of an additional $1,000 to be added to the previous appropriation of $500, making a total of $1,500 now available in this fund. Efforts are being made to secure from outside sources a considerable addition to this amount, in order to make possible the publication of certain important mathematical books. Under the fund already provided one book is being published through the agency of the Princeton University Press.

Cooperation with Bureau of Standards.—Arrangements have been made with the Bureau of Standards for loaning to university labora-

tories for a limited period of time apparatus or parts of apparatus difficult or impossible to obtain quickly, which are not in use at the time at the bureau. It has been arranged that investigators may go to the Bureau of Standards to pursue researches requiring the special facilities of the bureau when conditions are such that the work could not be carried out otherwise without considerable expense or loss of time.

Duplicates in astronomical libraries.—A request has been mailed to the various astronomical libraries in this country asking for lists of duplicate publications held in these libraries, together with information as to which of these duplicates the individual library is willing to sell, loan, or exchange. Complete returns are not as yet in this office, but it is the intention shortly to mimeograph replies to date and distribute, in order to facilitate the sale, loan, or exchange of such duplicate publications.

Collaboration with the research information service.—The division has prepared a code for the findex system and has aided in the findexing of the physicists in the United States.

Dr. F. E. Brasch, chief reference librarian of the James Jerome Hill Reference Library, St. Paul, Minn., is actively engaged in compiling astronomical bibliographies; Dr. J. B. Shaw, of the University of Illinois, is actively engaged in compiling mathematical bibliographies; and Dr. Karl K. Darrow is actively engaged in the preparation of physics bibliographies.

National research fellowships in physics and chemistry.—There are now 15 active fellows in physics and 22 active fellows in chemistry, with definite new appointments of 3 in physics and 6 in chemistry, making a total of 18 in physics and 28 in chemistry. There are, in addition, two applications which have been referred to board members with power upon which no action has as yet been taken.

DIVISION OF ENGINEERING.

[Alfred D. Flinn, Chairman.]

(For list of members, see Appendix A.)

Meetings of the division were held in New York at Engineers' Club on September 16, 1921, December 9, 1921, February 14, 1922, and April 21, 1922.

The year ending June 30, 1922, saw substantial work done. The fatigue of metals research has yielded definite laws regarding these phenomena. Methods, materials, and equipment for welding have been improved and the establishment of codes and standards advanced. The study of molding sands is beginning to effect economies in the foundries. The advisory board on highway research has done much to make researches more widely useful, to

promote additional research, and to bring together the public authorities, the technical organizations, and industries interested in the many phases of highway transport. In cooperation with the division of biology and agriculture the important marine piling investigations have been actively begun on all coasts of the country. Several committee reports have been published. The division is more effectively organized.

For each main branch of engineering there is an advisory board or committee of experts from scientific, engineering, and industrial organizations. These advisory committees are available for advice to National Research Council and Engineering Foundation in consideration of proposed projects or of problems arising during a research. These committees do not meet frequently, but appropriate members are consulted by correspondence through the division office. Advisory committees are now functioning in civil, mining and metallurgical, mechanical, electrical, highway, testing, and welding engineering.

Each project undertaken is supervised by a research committee, whose chairman is an authority. Results are published usually in the journal of the engineering society most interested. To stimulate interest in research, executives of industries are invited as guests to division meetings, "business" is condensed, and time given to speakers on timely subjects. Abstracts of addresses and discussions are published in appropriate journals.

Administrative expenses of the division (totaling approximately $18,000 for the year) were paid partly by the National Research Council and partly by Engineering Foundation. Means for research come in general from interested industries, public bodies and organizations, and, including services of staff engineers, laboratory facilities and materials, are estimated to amount to more than $1,000,000 for projects in progress during the past year. To facilitate cooperation with engineering societies and Engineering Foundation, the division has offices in the Engineering Societies Building, New York.

Advisory board on highway research.—This board, established with 15 member organizations in November, 1920, has been actively at work under the directorship of Dr. W. K. Hatt, professor of civil engineering and director of materials testing laboratory in Purdue University, who began his special duties with the board in July, 1921, with headquarters offices in the council's rooms and in the office of the United States Bureau of Public Roads, in Washington. The council's division of engineering, the Bureau of Public Roads, various State highway departments, United States Army, Engineering Foundation, engineering societies, colleges, and industries are cooperating in this project. For the staff necessities of the board about $15,000

were provided for the past fiscal year in addition to services contributed from various sources; for the coming year $30,000 will be necessary.

The director has traveled widely about the country, giving advice, aiding organization of research, and collecting information about researches in progress. Data are accumulating rapidly. The highway research census conducted by the board, for which 40 per cent of returns have been received, discloses that nearly 400 separate research projects are under way. Experimental investigations involving more than a half million dollars are in progress or authorized by Federal and State departments, universities, industries, and other organizations. The director has published a notable outline for a comprehensive national scheme of highway research.

Committee on economic theory of highway improvement.—The economic theory of highway improvement is being studied by a special committee. Traffic surveys, including important elements formerly neglected, are being made on the roads of several States, and will later be thoroughly analyzed. A subcommittee on tractive resistance of roads, supported by the Quartermaster's Department of the United States Army, United States Bureau of Public Roads, the States of Massachusetts and Connecticut, Harvard and Yale Universities, Massachusetts Institute of Technology, American Road Builders' Association, Portland Cement Manufacturers' Association, Society of Automotive Engineers, and various builders of auto trucks, has secured much valuable experimental information, which is now being studied. Efforts of the committee are now being directed to the designing of instruments which will accurately measure various elements entering into the gross tractive resistance of trucks under various conditions.

Marine piling investigations.—Because of the great damage—damage amounting to millions of dollars—to marine piling and other wooden structures in the harbor and bay of San Francisco by "shipworms" (boring mollusks), and at the suggestion of a committee organized in San Francisco in July, 1920, the division of engineering, in collaboration with the council's division of biology and agriculture, established a national committee on marine piling investigations, which has been very active during the past year under the direction of Col. William G. Atwood, formerly of the Engineer Corps of the United States Army. In addition a special port committee has been set up in New York. Funds to support the investigations have been obtained from various interested sources, especially railways with marine terminals. Cooperation in service and otherwise has been obtained from the United States Departments of Commerce, War, and Navy. Cooperation has also been assured by the Canadian Government and railways. The national committee is giving attention to the engineering,

chemical, and biological phases of the problem of protection. The director visited the Pacific coast in May and June and studied closely the results of two years' work by the San Francisco local committee.

American Bureau of Welding.—This bureau acts as a joint advisory board of the division and the American Welding Society on welding research and standardization. It has 10 research committees now at work on various phases of the welding problem, as electric-arc welding, gas welding, resistance welding, welding of storage tanks, welded rail joints, standard tests for welds, etc. All of these committees have been active during the year, and numerous reports of work accomplished have been prepared and published in standard engineering journals.

Committee on heat treatment of carbon steel.—This committee has for aim the increase of our now fragmentary knowledge of the influence of heat treatment on the mechanical properties of carbon steel, and especially to learn the conditions which most advantageously set up the sorbitic state, the most valuable for engineering purposes. A report embodying the results of much experimental work is now in process of preparation.

Committee on physical changes in iron and steel below the thermal critical range.—Work is in steady progress by members of the committee or under their direction at the various plants with which they are connected. Materials are contributed by the companies and tested at their laboratories and at the Bureau of Standards. Valuable reports have been recently prepared and published.

Committee on deoxidizers.—This committee is actively investigating the fundamental problems involved in the use of deoxidizers in steel manufacture. Cooperation has been secured from the manufacturers of deoxidizers and is being sought from the steel industry. The first phase of the committee's work is finished, and a report has been published. The second phase is organized and under way.

Committee on Neumann bands.—The committee is investigating the relation (if any) between the speed of rupture of a piece of steel and the resulting number of Neumann bands, and whether the presence of Neumann bands in metal is evidence of weakness. The Army and Navy are cooperating. A report by F. B. Foley and S. P. Howell, embodying results and conclusions to date, will be published in August by the American Institute of Mining and Metallurgical Engineers.

Committee on fatigue phenomena of metals.—This is one of the outstanding research committees of the division both from the point of view of the importance of the problem in hand and of the extent of the work actually being done and the financial support obtained for it. The work is in charge of Prof. H. F. Moore, of the University of Illinois, and most of it is done in the laboratories of the engineer-

ing experiment station of that university, which has provided expert service, laboratory space, and other facilities equivalent in value to about $6,000 a year. Engineering Foundation made a grant of $15,000 a year for two years beginning November, 1919, work under which was completed in October, 1921. In the summer of 1920 the General Electric Co. began to contribute an additional $30,000 to provide for an extension of the work to include 3 to 3½ per cent nickel steel. A comprehensive report on the basis of work accomplished was published in October, 1921, as Bulletin No. 124 of the University of Illinois engineering experiment station and in March, 1922, publication No. 4 of Engineering Foundation. A second report is in preparation. Active progress in work on the fatigue properties of special steels is being made.

Committee on uses of tellurium and selenium.—The committee has determined the amount of tellurium and selenium possible to produce if there were an unlimited market, and has ascertained the present uses. The chairman has discovered an unusual solvent, selenium oxychloride. A comprehensive report setting forth the methods of ore extraction of these elements has been prepared and will probably be published shortly. This report was written because certain investigations indicated that it was possible by use of selenium and tellurium to increase the fuel value of low-grade gasoline, and if such use were made the supply would not equal the demand.

Committee on new hardness-testing machine.—This committee, organized to develop a new machine for testing hardness of metals and other substances with higher capacity than the familiar Brinell apparatus and the scleroscope, has completed its work and summarized it in a paper published in July, 1921, in Mechanical Engineering.

A committee on the general subject of hardness testing of metals has secured cooperation from several Government laboratories, industrial companies, and individuals and is actively at work. Important papers are now being prepared by it for publication.

Committee on steel ingots.—This committee, organized during the war to determine the best open-hearth practice for the manufacture of gun steels and fine steels generally, has completed its work. Its report, offering probably the best specifications for acid open-hearth practice ever made, was published in January, 1922, by the American Institute of Mining and Metallurgical Engineers.

Committee on pulverizing.—This committee for the investigation of fundamental problems connected with pulverizing ores and other materials has secured cooperation from several universities and from the United States Bureau of Mines, which has agreed to assist through members of its staff and to pay one-half of the salary of a man to devote his whole time to the work of the committee. The bureau has requested the committee to act as an advisory commis-

sion on milling and pulverizing and to select five subjects of investigation for the Bureau of Mines fellows for 1923.

Committee on molding sands.—A project for the devising of better and more economical methods of the use of molding sands was organized under the auspices of the division and has the support of the American Foundrymen's Association and other interested industries. Various research subcommittees are at work on special parts of the general problem, and already thousands of dollars are being saved annually by the foundries of the country by following suggestions of the committee.

Committee on electrical core losses.—This committee is making an effort to reduce the calculation of electrical core losses as well as of eddy-current losses to a more rational and scientifically exact basis. Four phases of the work are now being conducted by four universities—Harvard, Massachusetts Institute of Technology, University of Missouri, Washington (St. Louis)—and by the General Electric Co., under the supervision of five members of the committee. A number of manufacturers are furnishing the services of their engineers and the facilities of their laboratories.

DIVISION OF CHEMISTRY AND CHEMICAL TECHNOLOGY.

[F. G. Cottrell, Chairman.]

(For list of members, see Appendix A.)

The annual meeting of the division was held in Rochester, N. Y., on April 24, 1922.

Critical tables of physical and chemical constants.—One of the most important undertakings in which the division of chemistry is interested is that of the compilation and publication of critical tables of physical and chemical constants. Dr. E. W. Washburn, professor of ceramic chemistry in the University of Illinois, and chairman-elect of the council's division of chemistry and chemical technology for 1922–23, has been appointed editor in chief of the tables, and will have as chief assistants an associate editor for chemistry and one for physics. Satisfactory relationships have also been worked out between the Annual Tables of Constants, edited by Dr. Charles Marie at Paris, and the Critical Tables, whereby all the material, both published and unpublished, which has been or is being gathered by the former board is made immediately available for the use of the latter, thus obviating duplication and delay. It should here be recalled that both the Annual and the Critical Tables are clearly recognized as international undertakings and as such have been taken under the official patronage of the International Union of Pure and Applied Chemistry and the International Research Council, but the primary responsibility for seeing to their successful carrying out is intrusted,

respectively, to France in the one case and the United States in the other. The Annual Tables are much the older project of the two, having been issued ever since 1910, thus antedating the formation of the Union of Pure and Applied Chemistry and the International Research Council themselves, while the project of the Critical Tables had its inception at the first meeting of these two bodies in 1919.

The Annual Tables aim to collect and publish all determinations of physical and chemical constants which have appeared anywhere during the year but without attempt to compare, weigh, or combine any of these data. The Critical Tables, on the other hand, aim to review all available data on each constant and from these determine and publish the most probable value deducible therefrom.

Although the general administrative work with regard to both these tables of constants has been more closely associated with the division of chemistry than any other of the technical divisions of the council, it must be fully realized that other divisions, especially physics, engineering, and biology and agriculture, are largely, if not equally, concerned in the results. In recognition of this fact, the advisory committee to American commissioner of International Commission on Annual Tables and Numerical Data has been transferred from the division of chemistry and chemical technology to be a committee of the executive board of the National Research Council, and thus coordinate with the trustees and the editorial board of the Critical Tables, both of which have always reported directly to the executive board.

Committee of ceramic research.—This is a joint committee representing the division and the American Ceramic Society. It has outlined for the coming year four chief topics for its activities, namely: (1) Study of the elements which determine the plastic nature of clay; (2) a critical examination of certain methods used in silicate analysis; (3) a study of the American pot clays and their proper compounding for the production of refractories used in the glass industry; and (4) a study of the relationship between crazing and the expansion coefficients of bodies and glazes.

Committee on chemistry of colloids.—This is one of the most widely active and productive committees of the division. A symposium on colloids was held at the Birmingham meeting of the American Chemical Society. The chairman of the committee has published a laboratory manual on the chemistry of colloids and has completed a bibliography of about 1,600 references which is now ready for publication. The committee has been instrumental in arranging for lectures on colloid chemistry by specialists at various universities and scientific and technical society meetings throughout the country and has done much to stimulate attention to the opportunities for work in this field in the regular courses of universities and technical schools.

Committee on contact catalysis.—The first report of this committee has just appeared in four successive numbers of the Journal of Industrial and Engineering Chemistry (April, May, June, and July, 1922) and will be reprinted as No. 30 of the council's reprint and circular series. Material for a further report is being assembled.

Committee on methods of organic analysis.—The manuscript for the fourth volume of Prof. S. P. Mulliken's Method for the Identification of Pure Organic Compounds was sent to the printer in October, 1921, but publication has been delayed by printing difficulties. It is expected that the volume will appear this summer. It includes characterization of 3,700 organic compounds belonging to 14 combinations of the elements.

Committee on preparation of list of research chemicals.—This is a joint committee representing the division and the research information service. A revised edition of its first report (issued in September, 1921, as No. 23 of the council's reprint and circular series) was issued in June, 1922, as No. 35 of the same series. This publication lists 80 firms in the United States representing the manufacture of research chemicals. The chemicals listed number about 2,000.

Committee on sewage disposal.—This committee having found it impracticable under existing conditions to carry out the program originally contemplated has been allowed to lapse.

Committee on publication of war data and information.—This is a joint committee representing the division of chemistry and the division of Federal relations. The committee has succeeded in securing the release for publication of several Government documents containing important data and information concerning war problems. A sympathetic attitude on the part of both the War and Navy Departments exists with respect to the publication of nonconfidential matter, but progress in the publication of this matter must necessarily be slow

Committee on explosives investigations.—This committee, under the chairmanship of Dr. Charles E. Munroe, has been one of the most active committees of the division and has completed a great deal of work during the last year. Based on the activities of this committee, more than a dozen papers have been completed and published during the year and several other papers are completed and ready for the printer, while a few others are in an advanced state of preparation. The special subjects of the committee's activities are: Development of Neumann bands in metal subjected to the action of explosives of known characteristics; utilization of surplus military explosives; physical constants of TNT, TNA, picric acid, and tetryl; the development of insensitiveness in cordeua detonant and TNT with age; water storage of explosives; burning of explo-

sives, particularly in large quantities; premature explosions in oil-well shooting; menace in storing carbide with explosives; danger in use of low-grade detonators; analytical methods as applied to explosives; explosions by influence; deterioration of mercuric fulminate; nitrate fires; utilization of surplus detonating devices; the explosibility of ammonium compounds.

National Research fellowships in physics and chemistry.—There are now 22 active fellows in chemistry and 15 active fellows in physics, with definite new appointments of 6 in chemistry and 3 in physics, making a total of 28 in chemistry and 18 in physics. There are, in addition, two applications which have been referred to board members, with power, upon which no action has as yet been taken.

DIVISION OF GEOLOGY AND GEOGRAPHY.

[EDWARD B. MATHEWS, Chairman.]

(For list of members, see Appendix A.)

The annual meeting of the division was held in Washington on April 21 and 22, 1922.

Government board of surveys and maps.—The division has continued its interest during the last year in the development of the United States board of surveys and maps, which represents the type of co-operative scientific undertaking in which the council is particularly interested. This board was established on December 31, 1919, by Executive order after the presentation of memorials and consideration of plans by the National Research Council, Engineering Council, and other organizations interested in the map-making activities of the Federal Government. The number of Federal bureaus now represented on the board is 18, and the public is represented by an advisory council of 21 selected from various engineering, scientific, and other organizations interested in the manufacture and use of maps. The chairman of the council's division of geology and geography has been chairman of this advisory council from its inception.

Investigation of glacial clays.—At the request of the division, the council appropriated $500 for cooperative support of an investigation of glacial chronology by Dr. Ernst Antevs through the detailed study of laminated clays. With the help of this fund Doctor Antevs was able to continue his field work and establish type sections across New England and northern New York. Through the assistance of the Carnegie Institution of Washington he will be enabled to extend his investigations to the clays of the extinct Lakes Bonneville and Lahontau in the Great Basin.

Bibliographies.—The project of securing a list of unpublished bibliographies on geology and geography has been accomplished, and the list published as No. 27 of the council's reprint and circular series.

The project, instituted conjointly with the research information service, to bring up to date de Margerie's Bibliography of Geological Bibliographies, which appeared about 25 years ago, has been practically completed. After an exhaustive search through the geological literature, including the complete files of over 300 periodicals, a list of about 4,000 entries has been made and cross indexed and the manuscript is ready for the press. The need of this compilation and publication has been called to the attention of the division by numerous working geologists.

Committee on sedimentation.—The work of the division's committee on sedimentation has enlisted more cooperation and more enthusiasm on the part of the workers than any other of the division's undertakings. This committee has enlisted the services of geologists of many special interests, as oceanographic, petrologic, geophysical, stratigraphic, and economic, together with men from other sciences representing interest in the biologic, pedologic, and physical-chemical phases of the sedimentation problem.

The committee has recently submitted to the division a report in which are presented by various members outlines of studies in sedimentation being carried on in the universities, problems suggested by State geologists, a review of investigations being carried on by Federal institutions, a bibliography of chemical and physical researches, an outline of the field descriptions and suggestions for color charts for sedimentary rocks and a full outline for a general treatise on sedimentation. Several geologists not members of the committee collaborated with the members in the preparation of this report.

In addition the committee has been able in several instances to bring about cooperative research by two or more organizations on problems which no single one of them would, or perhaps could, have undertaken alone. It has also helped through correspondence and conference various isolated workers who have sought advice. It is interesting to note that all of the work of this important and successful committee has been accomplished without special funds.

Committee on geography.—The division organized a committee to consider the best methods of assisting in the development of geographical sciences in America. It has had under its supervision the special work of preparing for publication certain geographical data accumulated in preparation for the Peace Conference at Versailles. This has included especially the preparation of soil vegetation, land classification, and rainfall maps of America. With the special assistance of Messrs. C. F. Marbut, H. L. Shantz, and J. B. Kincer, the manuscript text has been edited and is now ready for publication. It will appear probably in October, 1922. This work has been done in cooperation with the American Geographical Society and involved the financial cooperation of this society and the council.

This committee has also undertaken a number of other cooperative projects. One of the most important developments of the year in connection with the committee's work is the close cooperation which has been set up between the committee and the educational committee of the Association of American Geographers. Through this cooperation several definite plans for facilitating geographical research have been formulated.

Miscellaneous activities.—Recently the division of States relations requested the assistance of this division in a study of the organization of the work of State geological surveys, especially as regards research in cooperation with other agencies. This compilation has been completed and was presented to the division of States relations at its annual meeting on May 23.

Through the cordial relations which have been set up between the division and the Military Intelligence Division of the Army, a number of Russian general staff maps were secured for use of the important Roy Chapman Andrews expedition to Mongolia in the interests of the American Museum of Natural History.

A lengthy list of books on geology and geography was supplied to the newly opened James Jerome Hill Reference Library, of St. Paul. In the preparation of this list the division had the collaboration of the American Geographical Society and the National Geographic Society.

DIVISION OF MEDICAL SCIENCES.

[V. C. VAUGHAN, Chairman.]

(For list of members, see Appendix A.)

The annual meeting of the division was held in Washington on April 24, 1922.

Fellowships in medicine.—The most important new undertaking of the division during the last year has been its assumption of the responsibility of administering an appropriation, made jointly by the Rockefeller Foundation and the General Education Board, of $500,000, to be expended through five years at a rate of not more than $100,000 a year, for the maintenance of fellowships in medicine. The immediate administration of the fellowships has been placed in the hands of a special board, selected by the division, of eight men eminent in medical investigation and teaching, of which board the chairman of the division is ex officio chairman.

The following general statement has been made by the board to indicate the special purpose of the fellowships and the conditions under which they will be awarded:

(*a*) The chief purpose of these fellowships is to fit men and women for teaching in medical schools; (*b*) all branches of medicine, both preventive and curative, shall be open to those who seek the fellowships; (*c*) the fellowships are open to citizens of

both sexes of the United States and Canada; (*d*) applicants must have an M. D. or a Ph. D. degree or qualifications equivalent to that indicated by the possession of one of these degrees; (*e*) the stipend is to be determined by the medical fellowship board in each individual case; (*f*) the fellowships are not granted to institutions, and the fellow elects, with the approval of the board, the place where and the man or men under whom he will do his work.

Up to June 30, 1922, 13 fellowships had been awarded.

Research on sex problems.—At the invitation of the Bureau of Social Hygiene, the division interested itself in the matter of organizing a series of scientific investigations relating to fundamental sex problems in the fields of morphology, physiology, and psychology. With the financial aid of a gift of $1,000, a conference of a dozen competent scientific men and women interested in such problems was held in the council's rooms in Washington on October 29, 1921. This conference recommended that investigations relating to these problems be undertaken under the auspices and general direction of the division of medical sciences of the council with the cooperation of the Bureau of Social Hygiene, and that a permanent board be set up by the division to have immediate charge of the investigations. Mr. John D. Rockefeller, jr., offered to make available to the special board, through the council, the sum of $25,000 to meet the expenses of these investigations during the year July 1, 1922, to June 30, 1923. Such a board was accordingly organized, consisting of the following specialists: Dr. W. B. Cannon, professor of physiology in Harvard Medical School; Dr. E. G. Conklin, professor of zoology, Princeton University; Dr. Katherine B. Davis, of the Bureau of Social Hygiene; Dr. T. W. Salmon, of the Society of Social Hygiene and professor of psychiatry in the College of Physicians and Surgeons, Columbia University; and Dr. R. M. Yerkes, of the National Research Council, and some time professor of psychology in Harvard University. Doctor Yerkes was made chairman of the board and Mr. Earl F. Zinn, of the Bureau of Social Hygiene, was appointed a salaried full-time executive secretary of the board.

Study of goiter.—In September, 1921, the chairman of the division began to abstract the literature in the Surgeon General's library bearing on the prevalence and distribution of goiter in North America. This abstract as far as completed is now in the records of the division. An arrangement was made with Surgeon General Ireland by which charts and maps showing the percentage of rejections from Army service in the draft districts of various States for (*a*) simple goiter, (*b*) exophthalmic goiter were prepared. Prof. David C. Hall, of the University of the State of Washington, has supplied the division with a map of that State giving the distribution of goiter by counties as indicated by the examination of students entering the university. The division now has in its records three maps of the State of Washing-

ton indicating interesting facts with regard to the occurrence of goiter in that State. Map No. 1 gives the distribution of goiter among students, male and female, of an average age of 20 years, as distributed among the different counties of the State. Map No. 2 gives the percentage of rejections for simple goiter in the draft during the World War in the different draft districts of the State. Map No. 3 gives the same distribution for exophthalmic goiter. The division has asked the council to authorize the appointment of a special commission to prosecute further this study.

Tuberculosis death certificates in Colorado.—In December, 1921, the council, on recommendation of the division, appropriated $1,000 to be used by the Denver Sanatorium Association in a study of the death certificates of persons dying from tuberculosis in Colorado during the past 12 years. This work is being prosecuted under the immediate direction of Dr. Henry Sewall, of Denver. The object of this study is to make some contribution toward a solution of the important problem of the relation of climate to tuberculosis. If the present study in Colorado gives indications of apparent value, it is proposed to carry on similar investigations in other parts of the country.

Study of heart disease.—At the suggestion of Drs. Lewis A. Conner and Alfred E. Cohn, the division called a special meeting of its executive committee to consider, in collaboration with Doctors Conner and Cohn, a plan of research proposed by the Association for the Prevention and Relief of Heart Disease. This plan has as principal features the following: (*a*) To clarify phases in the incidence, etiology, and therapeutics of heart disease; (*b*) to obtain data for an economic bearing in patients suffering from clinical heart disease; (*c*) to afford opportunity for the study of certain clinical problems. The plan as proposed calls for a budget of $18,000 to be expended in the next 12 months. This plan was approved by the division and steps have been taken to secure the funds necessary for its carrying out.

Vestibular research.—In collaboration with the divisions of anthropology and psychology and of biology and agriculture, the division of medical sciences has taken part in the general direction of a research, called vestibular research, looking toward the solution of certain problems in aviation, which problems require for their solution an accurate analysis of the functions of equilibrium. The direction of the investigations is under the immediate charge of a special committee consisting of Dr. J. Gordon Wilson, professor of otology, Northwestern University, chairman; Dr. Raymond Dodge, professor of psychology, Wesleyan University; Dr. F. H. Pike, associate professor of physiology, University of Chicago; and the chairmen of the council's divisions of anthropology and psychology and of biology and agriculture and of medical sciences. The work

already accomplished in this research and the work under way are explained later in this report under the discussion of the activities of the division of anthropology and psychology.

Study of the relation between atmosphere and man.—This is an investigation carried on with the collaboration of the division of biology and agriculture. In January, 1922, a special committee was appointed, consisting of Dr. Ellsworth Huntington, research associate in geography, Yale University, chairman; J. Arthur Harris, botanical investigator, Station for Experimental Evolution, Carnegie Institution; C. E. McClung, professor of zoology, University of Pennsylvania; Raymond Pearl, professor of biometry and vital statistics, Johns Hopkins University; L. R. Jones, professor of plant pathology, University of Wisconsin; and the chairman of the division; as a result of which, investigations have been set under way through the cooperation of various factories and with financial support from various sources.

Standardization of biological stains.—This is a project being carried on primarily under the general direction of the division of biology and agriculture, but in which the division of medical sciences has been asked to cooperate. A special committee was appointed composed of Dr. H. J. Conn, associate bacteriologist, agricultural experiment station, Geneva, N. Y., chairman; S. I. Kornhauser, professor of zoology, Denison University; F. B. Mallory, pathologist, Boston City Hospital; F. G. Novy, professor of bacteriology, University of Michigan; and L. W. Sharp, assistant professor of botany, Cornell University. Doctors Mallory and Novy are special representatives of the division on this committee. Certain investigations in connection with this general project have been actively carried forward and preliminary reports of results published. Other details concerning this investigation will be found later in this report under the discussion of the activities of the division of biology and agriculture.

DIVISION OF BIOLOGY AND AGRICULTURE.

[L. R. Jones, Chairman.]

(For list of members, see Appendix A.)

The annual meeting of the division was held in Washington April 22, 1922.

This division has undertaken an exceptionally large number of projects, of which a classified list indicates that 7 may be looked on as completed and 25 as under way. In addition three new ones are projected and several others have been submitted for consideration.

Federation of biological societies.—One of the most interesting and important recent activities of the division has been in connection with a proposed federation of national biological societies for the

purpose of bringing to bear the combined attention and influence of all American working biologists, who are estimated to be at least 6,000 in number, on undertakings of importance and common interest to all these biologists. An example of such possible and needed undertakings is the much-discussed one of an improvement in publication facilities and the development of a journal for biological abstracts, to cover all biological journals and miscellaneous publications, both American and foreign. Progress in connection with this federation has been active and positive. Under the sponsorship of the council and division, two conferences have been held during the year, one at Toronto in December, 1921, and one at Washington in April, 1922. At the Washington conference accredited representatives of 18 national biological societies and of the 4 biological sections of the American Association for the Advancement of Science were present. At this conference arrangements were made for setting up a council of the federation consisting of two representatives of each society and the appointment by this council of an executive committee. A special joint committee on publications, representing the federation and the council's division of biology and agriculture was provided for.

Botanical abstracts.—The council at the recommendation of the division has, in addition to making certain grants of money, arranged to bring the bibliographic and editorial office of botanical abstracts to Washington, giving its office housing space in the council's rooms and providing for editorial and clerical assistance for 18 months beginning February 1, 1922. Dr. J. R. Schramm, editor of Botanical Abstracts, gives part of his time to work as scientific associate of the research information service and as executive secretary of this division.

Forestry projects.—The projects of this division relating to forestry, which are under the immediate administration of the special committee on forestry, have been pushed actively during the past year. Work on reforestation of cut-over lands and improved methods of silviculture have been carried on in 10 Southern States. This work will probably be concluded in the fall of 1922, and the field data worked up to form a report. Arrangement has been made for publication of a remarkable collection of international forestry statistics by the McGraw Hill Book Co.

Sulphur fellowships.—At the recommendation of the division, the council has accepted a gift from the Texas Gulf Sulphur Co. of $10,000 to be used for the maintenance of a series of research fellowships for studies on the agricultural uses of sulphur. Eight such fellowships have been established and appointments made for most of them.

Sigma Xi fellowships.—As a result of a small grant made by the council to the Sigma Xi Society in 1921 to promote its endeavors to

establish research fellowships in biology, funds have been secured by the society enabling it to offer several fellowships at a minimum of $1,600 each.

Standardization of biological stains.—This work is directed by a special committee representing the division, the Society of American Bacteriologists, Botanical Society of America, and American Society of Zoologists, together with representatives of the medical sciences. The work has been in active progress under the direction of Dr. H. J. Conn, of Geneva, with the aid of a grant of $1,000 from the Chemical Foundation. (See also under division of medical sciences.)

Biological relations of insects to flowers.—An investigation of the biological relations of insects to flowers, through the cooperative efforts of the division, the American Museum of Natural History, Cornell University, and the University of Colorado, has been undertaken and field work is now in progress in Colorado. The investigators include botanists, entomologists, and physicists.

Advisory board of the American Institute of Baking.—Closer cooperation between the American Institute of Baking and an advisory board set up at its request by the division has been established during the year. Under the supervision of Doctor Prescott, of the board, a study of mold infection of breads has been undertaken in his laboratory at the Massachusetts Institute of Technology. During the past year the institute has transferred its headquarters from Minneapolis to Chicago. One of its chief aims is to enlist the interest of graduate students in chemistry in the possibility of devoting their energy to problems of technical interest to the baking industry. Cooperative relations have already been established by the institute with several universities.

Food and nutrition projects.—One of the main pieces of work developed under the auspices of the committee on food and nutrition is that on the calcium of magnesium metabolism in women undertaken under the direction of Dr. Jean Bogert at the Kansas State Agricultural College. The work which was being done in animal nutrition under the supervision of the late Dr. H. P. Armsby, at Pennsylvania State College, is being continued under the direction of Prof. E. B. Forbes, of the same college. Preliminary results have already been published in the bulletin series of the council.

A special undertaking in connection with food-products investigation with the aid of funds donated by the Glass Container Association of America is an investigation of proper methods for determining the number and character of contaminating microorganisms affecting food products. Part of the work has been developed under the direction of Dr. R. S. Breed, of the Geneva Agricultural Experiment Station, and a report on this work is now being prepared for publication.

Investigations on the atmosphere and man.—With some financial support from the council, used especially for development and promotion work, the committee on atmosphere and man has been able to find additional financial support and to effect cooperative relations with various factories in which it is proposed to make investigations of the relation of atmosphere to the efficiency of the workers. Some of this work is already under way. (See also under division of medical sciences.)

Catalogue of unpublished bibliographies in biology.—Active work has been under way for several months on the preparation of a catalogue of unpublished bibliographies in biology.

Contagious abortion.—In connection with the contagious abortion project, a project undertaken jointly with the division of medical sciences, a committee has been appointed to coordinate the activities of the cooperating workers, including veterinarians, bacteriologists, etc., on this investigation.

Rust project.—The project for the bringing to completion, under the sponsorship of the division, of Dr. J. C. Arthur's important monograph on the North American rusts has enlisted the cooperative efforts of the United States Department of Agriculture, Purdue University, Pennsylvania State College, and Virginia Polytechnic Institute. A representative from each of these State institutions is to cooperate with Dr. Arthur in advancing this work.

Marine piling investigations.—This project, undertaken by the joint efforts of the division and the division of engineering, is one of the large projects of the council and is actively under way. (For special reference to it see division of engineering in this report.)

Conferences.—The division lays special stress upon the value of conferences on important biological problems and it has sponsored a number of these conferences during the year, notably a conference on biophysical problems, a genetics conference, a conference on contagious abortion, and conferences dealing with a federation of American biological societies. Certain of these conferences have already been referred to in connection with the special projects of the division.

DIVISION OF ANTHROPOLOGY AND PSYCHOLOGY.

[CARL E. SEASHORE, Chairman.]

(For list of members, see Appendix A.)

The annual meeting of the division was held in Washington on April 25, 1922.

Conference on anthropological problems.—On September 24, 1921, a conference of distinguished specialists, including psychologists,

medical men, and general biologists, was held in New York to consider the question:

From the point of view of applied racial psychology and anthropology to-day, what are the most timely and promising scientific projects of a basic nature that the division of anthropology and psychology of the National Research Council should attempt to formulate and foster?

A considerable variety of suggestions was made, of which five were generally approved for special consideration and active attention by the division, as follows:

1. The formulation of a procedure for the testing of fitness of prospective immigrants through the consulates of the various countries sending in immigrants on the 5 per cent basis. If there is to be a selection, there is no reason why we should not establish a preferential list, where more than the 5 per cent quota apply, and establish important minimum standards within the quota.

2. A consideration of the needs of vital statistics on the mental side of man for the purpose of encouraging census authorities and various voluntary organizations to insert certain desired items in their census or surveys, and to establish uniform procedure in the collection of these data.

3. The specification and standardization of the basic mental tests that should be observed, measured, and recorded in the comparison of races and other social groups. At the present time there is no consensus of opinion as to which traits are most significant, and there is no well-established technique of procedure.

4. The inheritance of mental traits: This is involved in many projects, and it may be well to give directions to a number of interests working in this field at the present time.

5. A review of the motives and mental conditions that tend to produce crime in this country, the object being to reveal the importance of the instinctive intellectual and mental forces which may be employed in the suppression of crime and the reduction of social unrest.

Committee on State archæological surveys.—The work of this committee during the year falls under two main heads: (1) Developing a plan for surveys in the Mississippi Valley and the formulation of technique for field work, and (2) the stimulation of activities in the several States. The committee has been able to arrange for the starting of surveys in Indiana, Iowa, and Missouri. The outlook is good for the initiation of a survey in Illinois. Other States are being approached. A handbook on State archæological surveys is being prepared by the committee.

Psychological abstracts.—The division has had for some time a committee on the initiation of a journal of psychological abstracts. In the light of the development of the plan for establishing a national federation of biological societies (see under division of biology and agriculture) and the probable founding by this federation of a journal of biological abstracts, the division has discharged this committee and set up a special committee on psychological abstracts for the purpose of cooperating with the federation of biological societies in order to standardize abstracts, encourage journals to require and

print authors' abstracts, and develop a single cooperative agency through which all biological (including psychological) abstracts shall be published.

National intelligence tests.—The work during the past year of this important committee—whose earlier work resulted in the preparation of a set of national intelligence tests for school children, published and distributed by hundreds of thousands to the schools of the country by the World Book Co., of Yonkers, N. Y.—has been largely routine. Through the World Book Co. the committee issued in May, 1921, a supplement to the manual of directions and later in the summer a revised edition. All royalties arising from these publications are devoted to financing the further work of the committee.

Material has been collected for the establishment of norms and the revision of old norms, taking into account geographical distribution, sex difference, and practice and methods of converting scores into "mental age" scores.

College entrance tests.—The division has set up a committee on college entrance tests, which is instructed to prepare for publication an annual survey of the subject.

Superior attainment of college students.—In collaboration with the division of educational relations the chairman of the division has taken an active part in planning and carrying on a special study of the problem of the college and university student of superior attainment, or the "gifted student," as he has been called. In this connection the chairman has written an "open letter to college seniors" calling attention to the opportunities open to competent students for careers in scholarship and research. Over 15,000 copies of this "open letter" have been provided college deans and special faculty committees, at their specific request, for distribution to members of graduating classes. The chairman has also prepared a bulletin on "Psychology as a career" and another on "The sectioning of classes on the basis of ability," both of which have been given a wide circulation. Dr. Clark Wissler, curator of anthropology in the American Museum of Natural History and member of the division, has prepared a bulletin on "Anthropology as a career," which has been published. (For further account of the work of the council in connection with the problem of the gifted student see Division of Educational Relations in this report.)

Committee on vestibular research.—The committee on vestibular research, a joint committee of three divisions of the council, of which the division of anthropology and psychology is one, is unusual in character by reason of the fact that each member of the committee is personally actively engaged in cooperative research on the problem before the committee. The special efforts of the committee are

directed toward a solution of the problem of animal equilibrium, especially the equilibrium of aviators. The reputed relation of the vestibule of the ear, including the semicircular canals, to equilibrium directs the work of the committee largely toward an investigation of this vestibule, and hence gives the committee its name.

One of the main problems of flying is the problem of balancing in the air. The factors which enter into balancing are complex and but partially known. Three known factors are recognized, the eye, the ear, the joint, muscle, and pressure sensations. Excessive stimuli from at least two of these, the eye and the ear, will result in vertigo. Any or all of these factors may give faulty information, which would tend to produce faulty control of the machine and possible disaster. The causes of this false information are known only in part. Faulty reactions while flying may also come from temporary pathological causes; for instance, blockage of the tube to the ear. These, if recognized, could be guarded against.

Statistics published by the United States War Department show that 96 per cent of fatalities during flying were due to faults or circumstances directly connected with the pilot, circumstances connected with an uncorrected maneuver, or a loss of control.

The purpose of this committee is not only to study the factors which enter into balancing but to study the factors which disturb this balance, and, if possible, to ascertain how to rectify such errors. Since certain individuals have their balance easily upset, the committee would study which particular factor or factors are at fault.

The researches of the committee are actively under way. Certain financial support has been given the committee by the council. (See also under Division of Medical Sciences.)

Immigration problems.—As a result of correspondence initiated by Dr. Robert DeC. Ward, of Harvard, informal conferences have been held with persons interested in the scientific approach to the problem of selective immigration, and there seems to be general agreement that a conference on this subject should be called early in the fall. This conference might meet in two divisions: First, a general conference made up of representatives of those in charge of the immigration examinations, Doctor Pierce, the Commissioner of Immigration, and the chairman of the Immigration Committees in the Senate and House, respectively, Professor Yerkes, Doctor Ward, and the chairman of this division. The object of this preliminary conference should be to establish cordial relations with those who are charged with the administration of the service. This might then be followed up by the organization of a smaller committee to consider the technical work of surveying methods of examination, aims and principles of selection, and cooperation with those engaged in the promotion of legislation.

Committee on stabilizing of scientific funds.—The chairman of the division has given much time during the year to the general problem of ways and means of encouraging and safeguarding funds for research. The history of permanent endowments for charity and science is tragic, in that most of the charters have been the creations of chance or some freakish notion which renders the purpose to be served impracticable and the custody of the funds unsafe. All this is very discouraging to those who desire to set aside money on a large scale in the interest of science. It is therefore clear that the National Research Council has a very important duty and responsibility for the undertaking of thorough investigations of the history of methods of organizing funds, the legal aspects, and methods of popularizing and promoting this interest in a business-like manner for the encouragement of gifts, their establishment on sound business principles, and their designation for permanently useful purposes.

One of the results of the chairman's study of this problem is a tentative proposal called "The elector plan for the administration of research funds," prepared by him personally with the advice of the committee on the subject consisting of President James R. Angell, Dr. Simon Flexner, and Dr. Charles D. Walcott.

Cooperation with other divisions.—In addition to the cooperation of the division with other divisions of the council on projects already mentioned, the division has cooperated with the divisions of medical sciences and biology and agriculture in two other projects, namely: Scientific research in problems of sex (see division of medical sciences in this report) and the relations of atmosphere and man (see division of biology and agriculture in this report).

APPENDIX A.

OFFICERS, MEMBERS, AND COMMITTEES.

Officers and Executive Board.

OFFICERS.

Honorary chairman, George E. Hale, director, Mount Wilson Observatory, Carnegie Institution of Washington, Pasadena, Calif.

Chairman of the executive board, John C. Merriam, president, Carnegie Institution of Washington, Washington, D. C.

First vice chairman, Charles D. Walcott, secretary, Smithsonian Institution; president National Academy of Sciences, Washington, D. C.

Second vice chairman, Gano Dunn, president, J. G. White Engineering Corporation, 43 Exchange Place, New York City.

Third vice chairman, R. A. Millikan, director, Norman Bridge Laboratory of Physics, California Institute of Technology, Pasadena, Calif.

Permanent secretary, Vernon Kellogg, National Research Council, Washington, D. C.

Assistant secretary, Albert L. Barrows, National Research Council, Washington, D. C.

Assistant secretary, Paul Brockett, assistant secretary, National Academy of Sciences, Washington, D. C.

Treasurer, F. L. Ransome, geologist in charge, section of metalliferous deposits, United States Geological Survey; treasurer, National Academy of Sciences, Washington, D. C.

By reciprocal arrangement with the Engineering Foundation—

Assistant secretary, Alfred D. Flinn, secretary, Engineering Foundation; chairman, division of engineering, National Research Council, 29 West Thirty-ninth Street, New York City.

EXECUTIVE BOARD.

Chairman, John C. Merriam.

Members ex Officio.

Officers of the council (except assistant secretaries).

President of the National Academy of Sciences, Charles D. Walcott, secretary, Smithsonian Institution, Washington, D. C.

Home Secretary of the National Academy of Sciences, C. G. Abbot, director, Astrophysical Observatory, Smithsonian Institution, Washington, D. C.

President of the American Association for the Advancement of Science, J. Playfair McMurrich, professor of anatomy, University of Toronto, Toronto, Canada.

Past chairman of the National Research Council, James R. Angell, president, Yale University, New Haven, Conn.

Chairmen of the divisions of general relations.

Chairmen and vice chairmen of the divisions of science and technology.

Members at Large.

Edward Dean Adams, engineer, 71 Broadway, New York City.

John J. Carty, vice president, American Telephone & Telegraph Co., 195 Broadway, New York City.

Gano Dunn, president, J. G. White Engineering Corporation, 43 Exchange Place, New York City.

William M. Jardine, president, Kansas State Agricultural College, Manhattan, Kans.

R. A. Millikan, director, Norman Bridge Laboratory of Physics, California Institute of Technology, Pasadena, Calif.

A. A. Noyes, director of chemical research, California Institute of Technology, Pasadena, Calif.

Raymond Pearl, professor of biometry and vital statistics, Johns Hopkins University, Baltimore, Md.

M. I. Pupin, professor of electromechanics, Columbia University, New York City.

S. W. Stratton, director, United States Bureau of Standards, Washington, D. C.

Ambrose Swasey, president, Warner & Swasey Co., Cleveland, Ohio.

William H. Welch, director, school of hygiene and public health, Johns Hopkins University, Baltimore, Md.

President, Sigma Xi Society, ex officio, Henry B. Ward, professor of zoology, University of Illinois, Urbana, Ill.

Administrative Committees of the Council.

Committee on budget (joint committee with National Academy of Sciences): Chairman, Charles D. Walcott; John C. Merriam, F. L. Ransome.

Committee on building plans: Chairman, George E. Hale; Gano Dunn, H. E. Howe, Vernon Kellogg, John C. Merriam, R. A. Millikan, A. A. Noyes, Augustus Trowbridge, Charles D. Walcott, with H. S. Pritchett in an advisory capacity, representing the Carnegie Corporation.

Committee on building stone (with reference to new building): Chairman, Charles D. Walcott; Vernon Kellogg, John C. Merriam.

Committee on finance: Chairman, John C. Merriam; John J. Carty, Gano Dunn, H. G. Gale, George E. Hale, H. E. Howe, Vernon Kellogg.

Committee on organization and budget: Chairman, H. E. Howe; Vernon Kellogg, F. L. Ransome.

Promotion committee: Chairman, H. E. Howe; Paul Moore.

Committee on publication and publicity: Chairman, Robert M. Yerkes; H .E. Howe, Vernon Kellogg, John C. Merriam.

Representatives of the Council on—

Editorial board of the Proceedings of the National Academy of Sciences: F. G. Cottrell, Alfred D. Flinn, H. G. Gale, L. R. Jones, Vernon Kellogg, E. B. Mathews, John C. Merriam, R. A. Millikan, F. L. Ransome, C. E. Seashore, V. C. Vaughan, Robert M. Yerkes; member of editorial executive committee, Vernon Kellogg.

Board of trustees of science service: George E. Hale, Vernon Kellogg, Robert M. Yerkes.

Commission of Swiss Natural Science Association for the Management of the Concilium Bibliographicum: Vernon Kellogg.

Technical Committees of the Council.

Committee on Concilium Bibliographicum: Chairman, Vernon Kellogg; L. R. Jones, J. R. Schramm, Robert M. Yerkes.

Committee on conservation of natural resources (acting as the Research Council section of the executive committee on natural resources of the American Association for the Advancement of Science, the National Academy of Sciences, and the National Research Council): Chairman, John C. Merriam; J. McKeen Cattell, John M. Clarke, Vernon Kellogg, C. E. McClung.

Committee to consider various phases of industrial research: Chairman, Gano Dunn; Comfort A. Adams, John J. Carty, George E. Hale, H. E. Howe.

Committee on cooperation with Research Corporation: Chairman, F. G. Cottrell; H. E. Howe, Augustus Trowbridge, Robert M. Yerkes.

Committee on Federal grants for research: Chairman, Vernon Kellogg; John J. Carty, Gano Dunn, S. W. Stratton, Charles D. Walcott, Robert M. Yerkes.

Committee on filing of sealed documents: Chairman, Paul Brockett; F. G. Cottrell, H. E. Howe.

Committee on Patent Office: Chairman, L. H. Baekeland, honorary professor of chemical engineering, Columbia University; residence, Yonkers, N. Y.; secretary, Edwin J. Prindle, 111 Broadway, New York City; W. F. Durand, Thomas Ewing, Frederick P. Fish, Reid Hunt, R. A. Millikan, M. I. Pupin, S. W. Stratton, C. P. Townsend.

Trustees for the publication of International Critical Tables: Chairman, George P. Adamson, president, General Chemical Co., 25 Broad Street, New York City; secretary, W. M. Corse; H. E. Howe, Edward P. Hyde, Hugh K. Moore, Charles L. Reese, Julius Stieglitz.

Editorial board for publication of International Critical Tables: George K. Burgess, Saul Dushman, John Johnston, C. E. K. Mees, C. E. Mendenhall, R. B. Moore.

Executive committee of the American Geophysical Union: Chairman, William Bowie, Chief, Division of Geodesy, United States Coast and Geodetic Survey, Washington, D. C.; vice chairman, Louis A. Bauer, director, department of terrestrial magnetism, Carnegie Institution of Washington, Washington, D. C.; secretary, W. J. Humphreys, professor of meteorological physics, United States Weather Bureau, Washington, D. C.; F. G. Cottrell, Arthur L. Day, H. G. Gale, L. R. Jones, G. W. Littlehales, C. F. Marvin, E. B. Mathews, R. A. Millikan, H. F. Reid, H. S. Washington.

DIVISIONS OF THE COUNCIL.

Division of Federal Relations.

Chairman, Charles D. Walcott.
Vice chairman, A. P. Davis.
Secretary, H. G. Gale.

EXECUTIVE COMMITTEE.

Chairman, Charles D. Walcott; vice chairman, A. P. Davis; secretary, H. G. Gale; William Bowie, Brigadier General A. A. Fries, S. W. Stratton.

MEMBERS OF THE DIVISION.

H. G. Gale, professor of physics, University of Chicago; chairman, division of physical sciences, National Research Council, Washington, D. C.

EX OFFICIO.

Robert M. Yerkes, chairman, research information service, National Research Council, Washington, D. C.

The President of the United States, on the recommendation of the president of the National Academy of Sciences, acting as chairman of the division of federal relations of the National Research Council, has designated the following representatives of the various departments to act as members of this division:

DEPARTMENT OF STATE.

Wilbur J. Carr, Director, Consular Service.

DEPARTMENT OF THE TREASURY.

J. W. Schereschewsky, Assistant Surgeon General, Public Health Service.

DEPARTMENT OF WAR.

Lieut. Col. Edward T. Donnelly, General Staff, United States Army.
Lieut. Col. W. B. Graham, Military Intelligence Division, United States Army.
Col. Clarence H. McNeil, Coast Artillery, United States Army.
Col. Joseph S. Siler, Medical Corps, United States Army.
Lieut. Col. Clarence O. Sherrill, Engineer Corps, United States Army.
Col. Colden L'H. Ruggles, Ordnance Department, United States Army.
Maj. Gen. George O. Squier, Chief Signal Officer, United States Army.
Maj. Henry W. Harms, Air Service, United States Army.
Brig. Gen. A. A. Fries, Chief, Chemical Warfare Service, United States Army.

DEPARTMENT OF JUSTICE.

William D. Riter, Assistant Attorney General.

POST OFFICE DEPARTMENT.

Joseph Stewart, special assistant to the Attorney General.

DEPARTMENT OF THE NAVY.

Director, Intelligence Division, Office of Naval Operations, United States Navy.
Superintendent, Naval Observatory, Bureau of Navigation, United States Navy.
Rear Admiral Luther E. Gregory, Chief, Bureau of Yards and Docks, United States Navy.
———, Bureau of Ordnance, United States Navy.
Rear Admiral D. W. Taylor, Chief Constructor of the Navy, and Chief, Bureau of Construction and Repair, United States Navy.
Rear Admiral R. S. Griffin, Chief, Bureau of Engineering, United States Navy.
Rear Admiral Edward R. Stitt, Surgeon General, and Chief, Bureau of Medicine and Surgery, United States Navy.

DEPARTMENT OF THE INTERIOR.

William A. Kinnan, First Assistant Commissioner of Patents, Patent Office.
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Berthold Laufer, curator of anthropology, Field Museum of Natural History, Chicago, Ill.

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under the direction of a research fellowship board appointed by the council of the National Academy of Sciences and the executive board of the National Research Council acting jointly.

The members appointed on this board serve for a period of five years. With them the chairman of the divisions of physical sciences and of chemistry and chemical technology, appointed annually, serve in an ex officio capacity.

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Elmer P. Kohler, professor of chemistry, Harvard University, Cambridge, Mass.

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H. G. Gale, chairman, division of physical sciences, National Research Council; professor of physics, University of Chicago; executive secretary, research fellowship board for 1921–22, Washington, D. C.

Fellowships for 1921–22 have been awarded to the following persons, who have demonstrated a high order of ability in research, for the purpose of enabling them to conduct investigations at educational institutions which make adequate provision for research in physics and chemistry.

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F. Russell Bichowsky.
Frederick L. Browne.
George L. Clark.
Edwin J. Cohn.
Roscoe G. Dickinson.
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Rolla Neil Harger.
Selig Hecht.
David C. Jones.
Morris Kharasch.
Albert G. Loomis.
Robert S. Mulliken.
Axel R. Olson.
C. S. Palmer.
Henry C. Parker.
Robert N. Pease.
Leonard F. Yntema.

IN PHYSICS.

Ernest F. Barker.
Gregory Breit.
John S. Foster.
Allen Garrison.
Paul S. Helmick.
E. H. Kurth.
Leonard B. Loeb.
John P. Minton.
Jared K. Morse.
George P. Paine.
Henry DeW. Smyth.
Louis T. E. Thompson.
Joseph Valasek.

APPENDIX B.

ARTICLES OF ORGANIZATION AS AMENDED UP TO JUNE 30, 1922.

PREAMBLE.

The National Academy of Sciences, under the authority conferred upon it by its charter enacted by Congress, and approved by President Lincoln on March 3, 1863, and pursuant to the request expressed in an Executive order made by President Wilson on May 11, 1918, adopts the following articles of organization for the National Research Council, to replace the temporary organization under which it has operated heretofore:

ARTICLE I—PURPOSE.

It shall be the purpose of the National Research Council to promote research in the mathematical, physical, and biological sciences, and in the application of these sciences to engineering, agriculture, medicine, and other useful arts, with the object of increasing knowledge, of strengthening the national defense, and of contributing in other ways to the public welfare, as expressed in the Executive order of May 11, 1918.

ARTICLE II—MEMBERSHIP.

SECTION 1. The membership of the National Research Council shall be chosen with the view of rendering the council an effective federation of the principal research agencies in the United States concerned with the fields of science and technology named in Article I.

SEC. 2. The council shall consist of representatives of national scientific and technical societies; representatives of the Government, as provided in the Executive order; and representatives of other research organizations and other persons whose aid may advance the objects of the council.

ARTICLE III—DIVISIONS.

SECTION 1. The council shall be organized in divisions of two classes: Divisions dealing with the more general relations and activities of the council and divisions dealing with special branches of science and technology.

SEC. 2. The initial constitution of the divisions of the council shall be as follows:

Divisions of general relations: Division of Federal relations, division of foreign relations, division of States relations, division of educational relations, division of research extension, and research information service.

Divisions of science and technology: Division of physical sciences, division of engineering, division of chemistry and chemical technology, division of geology and geography, division of medical sciences, division of biology and agriculture, and division of anthropology and psychology.

SEC. 3. The number of divisions and the grouping of subjects in Article III, section 2, may be modified by the executive board of the National Research Council.

SEC. 4. The divisions of general relations shall be organized by the executive board of the National Research Council. (Art. IV, sec. 2.)

SEC. 5. To secure the effective federation of the principal research agencies in the United States, provided for in Article II, a majority of the members of each of

the divisions of science and technology shall consist of representatives of scientific and technical societies, who shall be chosen as provided for in Article V, section 2. The other members of the division shall be nominated by the executive committee of the division, approved by the executive board of the National Research Council, and appointed in accordance with Article V, section 4.

SEC. 6. The divisions of the council, with the approval of the executive board, may establish sections and committees, any of which may include members chosen outside the membership of the council.

ARTICLE IV—ADMINISTRATION.

SECTION 1. The affairs of each division shall be administered by a chairman, one or more vice chairmen, and an executive committee, of which the chairman and vice chairman shall be ex officio members. The officers and the executive committee of each of the divisions of general relations shall be appointed by the executive board for such periods as may be determined by the board, except that the foreign secretary of the National Academy of Sciences shall be ex officio chairman of the division of foreign relations. The officers and executive committee of each of the divisions of science and technology shall be elected by the division at its annual meeting and confirmed by the executive board.

SEC. 2. The affairs of the National Research Council shall be administered by an executive board, of which the officers of the National Research Council, the president and home secretary of the National Academy of Sciences, the president of the American Association for the Advancement of Science, the chairmen and vice chairmen of the divisions of science and technology, and the chairmen of the divisions of general relations shall be members ex officio. In the absence of the chairman of a division the vice chairman or other executive officer shall represent him. The council of the National Academy of Sciences and the executive board of the National Research Council, acting jointly, may nominate additional members, not to exceed 12 in number, who, if not already members of the National Research Council, shall be appointed thereto by the president of the National Academy of Sciences for terms of three years. Upon their retirement chairmen of the National Research Council shall continue as members of the executive board for two years beyond the period of their appointment. Subject to the approval of the executive board, the business of the council may be transacted by an interim committee constituted as defined in the by-laws.

SEC. 3. The officers of the National Research Council shall consist of a chairman, a chairman of the executive board, one or more vice chairmen, a permanent secretary, and a treasurer, who shall also serve as members and officers of the executive board of the council.

SEC. 4. The officers of the National Research Council, excepting the permanent secretary and the treasurer, shall be elected annually by the executive board. The permanent secretary of the council shall be elected by the executive board for a period of one year or more. The treasurer of the National Academy of Sciences shall be ex officio treasurer of the National Research Council.

SEC. 5. The duties of the officers of the council and of the divisions shall be fixed by the executive board.

ARTICLE V—NOMINATIONS AND APPOINTMENTS.

SECTION 1. The Government bureaus, civil and military, to be represented in the division of Federal relations and the scientific and technical societies, to be represented in the divisions of science and technology of the National Research Council, shall be determined by joint action of the council of the National Academy of Sciences and the executive board of the National Research Council.

SEC. 2. Representatives of scientific and technical societies shall be nominated by the societies, at the request of the executive board, and appointed by the president of the National Academy of Sciences to membership in the council and assigned to one of its divisions.

SEC. 3. The representatives of the Government shall be nominated by the president of the National Academy of Sciences after conference with the secretaries of the departments concerned, and the names of those nominated shall be presented to the President of the United States for designation by him for service with the National Research Council.

SEC. 4. Other members of the council shall be nominated by the executive committees of the divisions, approved by the executive board, and appointed by the president of the National Academy of Sciences to membership and assigned to one of the divisions.

SEC. 5. Members of the council shall be appointed for terms of three years, except when appointed to fill unexpired terms.

SEC. 6. The Government representatives shall serve for periods of three years, unless they previously retire from the Government office which they represent, in which case their successors shall be appointed for the unexpired term.

ARTICLE VI—MEETINGS.

SECTION 1. Meetings of the council may be held on call of the executive board.

SEC. 2. The executive board and the divisions shall hold annual meetings, at which, in the case of the divisions of science and technology, officers shall be elected; such other meetings may be called as may be required for the transaction of business. The annual meeting of the executive board shall be held in April in the city of Washington, on a date to be determined as the board may direct.

SEC. 3. Joint meetings of the executive board of the National Research Council and the council of the National Academy of Sciences shall be held from time to time, to consider any matters which, in the judgment of the president of the National Academy, require the attention of both bodies.

ARTICLE VII—PUBLICATIONS AND REPORTS.

SECTION 1. An annual report on the work of the National Research Council shall be presented by the chairman to the National Academy of Sciences for submission to Congress in connection with the annual report of the president of the academy.

SEC. 2. Other publications of the National Research Council may include papers, bulletins, reports, and memoirs, which may appear in the proceedings or memoirs of the National Academy of Sciences, in the publications of other societies, in scientific and technical journals, or in a separate series of the Research Council.

ARTICLE VIII—AMENDMENTS.

SECTION 1. Power of amendment of these articles of organization shall reside in the council of the National Academy of Sciences.

ANNUAL REPORT OF THE TREASURER.

(July 1, 1921, to June 30, 1922.)

To the PRESIDENT OF THE NATIONAL ACADEMY OF SCIENCES:

I have the honor to submit the following report as treasurer of the academy for the year from July 1, 1921, to June 30, 1922, and as treasurer of the National Research Council for the same period. As is customary, this report is divided into two sections, the first covering the accounts of the National Academy of Sciences and the second covering those of the National Research Council.

In June, 1922, the complete list of investments held by the academy was submitted to Spencer Trask & Co., New York, with a request that it be carefully examined and that suggestion be made of any changes deemed advisable. The reply expressed approval of all the securities and the only recommendations made were (1) that one lot of bonds which were approaching maturity be sold and the money reinvested, and (2) that the academy's $16,000 in British 5½s of 1929, selling at about 109, be exchanged for British 5½s of 1937 at about 102. The first suggestion was followed. The second, which was rather tentatively made, has not yet been acted upon, for if sterling exchange, as seems likely, goes higher the 1929 bonds (convertible at $4.30 to the pound sterling) will still further appreciate in value.

As usual, the greater part of the actual work pertaining to the treasurer's office has been performed by Mr. J. H. J. Yule, the bursar, whose industry, faithfulness, and initiative deserve hearty commendation.

NATIONAL ACADEMY OF SCIENCES.

The total income of the academy from gifts, dues, interest on investments, subscriptions, and contributions to proceedings amounted to $129,762.41. The miscellaneous disbursements amounted to $133,660.93, and payments on grants and for medals from trust funds amounted to $7,922.90.

The total book value of the investments held by the academy on June 30, 1922, was $331,931.75, yielding interest at that date at the rate of 5.45 per cent on the sum named. The market value of these investments on June 30, 1922, as nearly as could be determined, was $329,052.95 and the interest rate as computed on that sum was 5.60 per cent.

The following table is given to show the diversification of the securities held by the academy:

	Amount.	Per cent.
United States Government bonds	$26,200	7.61
Foreign governments bonds	27,500	7.99
Improved real estate bonds	73,500	21.34
Improved real estate mortgage notes	19,000	5.52
Railroad bonds	55,200	16.03
Municipal bonds	10,000	2.90
Public utilities bonds	37,000	10.74
Power bonds	96,000	27.87
Total	344,400	100.00

Special contributions from members of the academy, amounting to $50, were received by Dr. Charles D. Walcott for the purpose of financing in a more satisfactory way the cost of publishing the proceedings of the academy, the sum named being additional to the $3,171 reported by me last year for the same purpose. A contribution of $1,000 was received from the William Ellery Hale fund for the support of the proceedings.

The sum of $46,190.74 has been received during the year from the Carnegie Corporation of New York, and a similar sum has been disbursed for plans and services for a new building for the use of the National Academy of Sciences and the National Research Council.

Three additional installments, amounting to $16,750, making a total now of $21,750, were received on the bequest of Mrs. Mary Anna Palmer Draper for the Billings fund.

The Pennsylvania Co. for Insurance on Lives and Granting Annuities has remitted to the academy in cash, on account of the Joseph Henry fund, the sum of $18,850.98, of which $1,311.41 was income and $17,539.57 was capital. This company has also turned over to the academy on account of this fund high-grade bonds having a face value of $22,200, representing invested capital, making total receipts in cash and bonds from this source $41,050.98. The capital account of this fund now stands at $39,739.57.

Changes in investments may be summarized as follows: Loans on real estate aggregating $2,500 were paid at maturity. Five bonds of a face value of $5,000 were called for redemption. Sixty-six bonds of a total face value of $59,000 were purchased for $53,486.25. Twenty-five bonds of a face value of $22,200 were acquired from the Pennsylvania Co. for insurance on lives and granting annuities.

The consolidated investment fund now totals $232,235.07, an increase of $56,489.57 having been made since the last report, of which $16,750 represents an increase in the Billings fund and $39,739.57 represents the capital of the Joseph Henry fund.

TRUST FUNDS OF THE ACADEMY.

The trust funds of the academy, the income of which is administered for specific purposes, are enumerated below. The capital of certain funds has been increased beyond the amount of the original gift or bequest by the transfer of accumulated income at the request of the donors or by action of the academy.

Bache fund: Bequest of Alexander Dallas Bache, a member of the academy, 1870. To aid researches in physical and natural sciences	$60,000.00
Watson fund: Bequest of James C. Watson, a member of the academy, 1874. For the promotion of astronomical science through the award of the Watson gold medal and grants of money in aid of research	25,000.00
Draper fund: Gift of Mrs. Henry Draper, 1883. In memory of her husband, a former member of the academy. To found the Henry Draper gold medal, to be awarded for notable investigations in astronomical physics. The balance of income is applied to aid research in the same science	10,000.00
Smith fund: Gift of Mrs. J. Lawrence Smith, 1884. In memory of her husband, a former member of the academy. To found the J. Lawrence Smith gold medal, to be awarded for important investigations of meteoric bodies and to assist, by grants of money, researches concerning such objects	10,000.00
Gibbs fund: Established by gift of Wolcott Gibbs, a member of the academy, 1892, and increased by a bequest of the late Morris Loeb, 1914. For the promotion of researches in chemistry	5,545.50
Gould fund: Gift of Miss Alice Bache Gould, 1897. In memory of her father, a former member of the academy. For the promotion of researches in astronomy	20,000.00
Comstock fund: Gift of Gen. Cyrus B. Comstock, a member of the academy, 1907. To promote researches in electricity, magnetism, or radiant energy through the Comstock prize of money, to be awarded once in five years for notable investigations. The fund is to be increased, ultimately, to $15,000	12,406.02
Marsh fund: Bequest of Othniel Charles Marsh, a member of the academy, 1909. To promote original research in the natural sciences. To the original bequest of $10,000 the academy has added interest received from the estate and has authorized the increase of the fund to $20,000 by annual additions from income	20,000.00
Murray fund: A gift from the late Sir John Murray, 1911. To found the Alexander Agassiz gold medal, in honor of a former member and president of the academy, to be awarded for original contribution to the science of oceanography	6,000.00
Hartley fund: A gift from Mrs. Helen Hartley Jenkins, 1913–14, in memory of her father, Marcellus Hartley, to found the medal of the academy awarded for eminence in the application of science to the public welfare	1,200.00
Billings fund: Established by the bequest of Mrs. Mary Anna Palmer Draper (Mrs. Henry Draper) of $25,000, 1915. To support the publication of the proceedings of the academy or for other purposes, to be determined by the academy, six installments	21,750.00
Elliot fund: Gift of Margaret Henderson Elliot, to found the Daniel Giraud Elliot gold medal and honorarium for the most meritorious work in zoology or paleontology published in each year	8,000.00

Thompson fund: Gift of Mrs. Mary Clark Thompson, 1919, the income thereof to be applied for a gold medal of appropriate design to be awarded annually by the academy for the most important services to geology and paleontology, the medal to be known as the Mary Clark Thompson gold medal..... $10,000.00

Joseph Henry fund: The sum of $40,000 was contributed by Fairman Rogers, Joseph Patterson, George W. Childs, and others, as an expression of their respect and esteem for Prof. Joseph Henry. This amount was deposited with the Pennsylvania Co. for the insurance of lives and granting annuities in trust, with authorization to collect the income thereon and to pay over the same to Prof. Joseph Henry during his natural life, and after his death to his wife and daughters, and after the death of the last survivor to "deliver the said fund and the securities in which it shall then be invested to the National Academy of Sciences, to be thenceforward forever held in trust under the name and title of the 'Joseph Henry fund.'" The death of Miss Caroline Henry on November 10, 1920, has removed the last surviving heir of Joseph Henry to the income of the Joseph Henry fund. To assist meritorious investigators, especially in the direction of original research. Amount received by the academy from the Pennsylvania Co..... 39,739.57

In addition to the above-named funds the academy holds the following:

Agassiz fund: Bequest of Alexander Agassiz, a member of the academy, 1910, for the general uses of the academy..... 50,000.00

Total..... 299,641.09

Statement of assets and liabilities, June 30, 1922.

ASSETS.

[Bonds purchased during the year are indicated thus *.]

	Face value.	Book value.	Market value, June 30, 1922.
Mortgage notes, secured by first mortgage on real estate.....	$19,000.00	$19,000.00	$19,000.00
Bonds:			
American Telephone & Telegraph Co., 30-year 5 per cent gold collateral trust, due Dec. 1, 1946; Nos. 4604, 29245, 29246, 41419; 4, at $1,000.....	4,000.00	3,817.50	3,890.00
Asheville Power & Light Co., first mortgage, 30-year gold, 5 per cent, due Apr. 1, 1942, New York; Nos. 272, 490, 492, 508, 509; 5, at $1,000.....	5,000.00	4,892.50	4,550.00
Broadway Realty Co., purchase money first 5 per cent gold, due Sept. 1, 1926; Nos. 50, 796, *906, *922, *923, 963–965, *1005, 1068, 1102, 1139, *1574, 1616–1620, 1629, 1630; 20, at $1,000.....	20,000.00	19,605.00	18,000.00
Bush Terminal Buildings Co., first mortgage 50-year sinking fund, 5 per cent, gold, due Apr. 1, 1960; Nos. 1383–1387 and 2805–2809; 10, at $1,000.....	10,000.00	9,375.00	9,000.00
Chesapeake & Ohio, general mortgage, 4.5 per cent, gold, due New York, Mar. 1, 1992; Nos. 15350–15354; 5, at $1,000.....	5,000.00	4,600.00	4,350.00
City of Tacoma, Green River special water fund No. 2, 5 per cent, due Oct. 1, 1939; Nos. 1508–1511; 4, at $1,000.....	4,000.00	4,140.00	3,920.00
*City of Toronto, Canada, Harbour Commissioners, 4½ per cent gold, due Sept. 1, 1953; Nos. A13744–5, A14040, A14099, A15464, A15466; 6, at $1,000.....	6,000.00	5,400.00	5,250.00

Statement of assets and liabilities, June 30, 1922—Continued.

ASSETS—Continued.

	Face value.	Book value.	Market value, June 30, 1922.
Bonds—Continued.			
Cleveland Electric Illuminating Co., first mortgage, 5 per cent, due New York, Apr. 1, 1939; Nos. M6060, M6096, M6097, *M9730, *M14911, *M14912, M15094–M15098; 11, at $1,000; Nos. D261–D264; 4, at $500	$13,000.00	$12,297.50	$12,675.00
*Commonwealth Edison Co., first mortgage, gold, 6 per cent, due June 1, 1943; Nos. 58097–58100; 4, at $1,000	4,000.00	3,660.00	4,200.00
Commonwealth Electric Co., first 5 per cent, due June 1, 1943; Nos. 2945–2947, 4011; 4, at $1,000	4,000.00	3,600.00	3,880.00
*Consolidated Gas, Electric Light & Power Co. of Baltimore, first refunding mortgage, 7 per cent, sinking fund, gold, series C, convertible, due Oct. 1, 1931; Nos. M4583–M4592; 10, at $1,000	10,000.00	9,900.00	10,500.00
Cosmos Club, 4.5 per cent, due July 1, 1949; Nos. 286–289, 291–294, 296, 297, 299, 301, 303–305, 350; 16, at $1,000	16,000.00	16,000.00	12,000.00
Detroit Edison Co., first and refunding mortgage, gold, 5 per cent, due Jan. 1, 1940; Nos. 9657–9660; 4, at $1,000; and Nos. D501, D502, D599; 3, at $500	5,500.00	5,005.00	5,115.00
Detroit Edison Co., first mortgage, 30-year gold, 5 per cent, due Jan. 1, 1933; Nos. 557, 2442, 2443, 3024, 3252, 3253, 3639–3641, 8086; 10, at $1,000	10,000.00	10,072.50	9,800.00
*Detroit Edison Co., first and refunding mortgage, 6 per cent, gold, due June 1, 1940; Nos. B14308, B14298, B14299, B16655; 4, at $1,000; No. BD2048; 1, at $500	4,500.00	3,960.00	4,410.00
Dominion Coal Co. (Ltd.), first mortgage, sinking fund, gold, 5 per cent, due New York, Mar. 1, 1940; Nos. A1038, A1039; 2, at $1,000	2,000.00	1,812.50	1,700.00
*Dutch East Indies, 40-year external sinking fund, gold, 6 per cent, due Mar. 1, 1962; trust receipts Nos. 8058, 41407; 2, at $1,000; No. D2490; 1, at $500	2,500.00	2,386.25	2,362.50
Galveston, Harrisburg & San Antonio, Mexican and Pacific Ex., 6 per cent, second guaranteed; reduced to 5 per cent, due Jan. 1, 1931; Nos. 1044, 1048, 1248, 2112–2116; 8, at $1,000	8,000.00	8,030.00	7,540.00
Georgia Railway & Electric Co., first consolidated mortgage, 5 per cent, sinking fund, gold, due Jan. 1, 1932; Nos. 191, 1061, 1600; 3, at $1,000	3,000.00	2,995.00	2,745.00
Grand Rapids Gas Light Co., 5 per cent, first mortgage, gold, due New York, Aug. 1, 1939; Nos. A522, A523, A595, A596; 4, at $1,000	4,000.00	4,020.00	3,720.00
*Grand Trunk Western Railway Co., first mortgage, 50-year gold, 4 per cent, due July 1 1950; Nos. 4304, 5605, 5606; 3, at $1,000; Nos. 15, 265, 774, 781, 839, 994, 1019, 1055, 1059, 1104, 1189, 1378, 2738, 2884, 2942; 15, at $500	10,500.00	7,690.00	7,875.00
Great Northern Ry. Co., *7 per cent, 15-year general mortgage, series A, due July 1, 1936; temporary certificates; Nos. TM67750–TM67755; 6, at $1,000; TC4849, TC4850; 2, at $100; TD3817; 1, at $500	6,700.00	6,465.50	7,311.38
Hydraulic Power Co. of Niagara Falls, 5 per cent, refunding and improvement mortgage, due Oct. 1, 1951; Nos. *M1990–*M1994; 5 at $1,000; Nos. D244, D457, D458; 3, at $500	6,500.00	5,670.00	6,240.00
*Lehigh Valley Railroad Co., 6 per cent registered Consolidated Mortgage loan annuity bonds, dated Nov. 13, 1873; Nos. 1739–1758; 20, at $1,000	20,000.00	20,000.00	20,600.00

Statement of assets and liabilities, June 30, 1922—Continued.

ASSETS—Continued.

	Face value.	Book value.	Market value, June 30, 1922.
Bonds—Continued.			
*Liberty, second, converted, 4¼ per cent; 1927–1942; No. CO-1636598; 1, at $100; No. COO929688; 1, at $50	$150.00	$150.00	$148.47
Liberty, third loan, 4¼ per cent, gold of 1928; Nos. 8329 at $10 000; Nos. 2643499–2643523; 25 at $100; and Nos. 4070782–4070787; 6 at $50	12,800.00	12,800.00	12,825.60
Liberty fourth loan 4¼ per cent gold of 1933–1938; Nos. DO4770174 EO4770175; 2 at $100; No. *GOO497557; 1 at $1 000; No. *DO1819904; 1 at $50	1,250.00	1,250.00	1,260.00
Michigan Northern Power Co. first mortgage guaranteed 5 per cent, due 1941; Nos. 5054, 5057, 5216, 5516, 5567–5571, 8515; 10 at $1,000; and Nos. 4367, 4368; 2 at $500	11,000.00	9,540.00	10,120.00
Milwaukee Electric Railway & Light Co. 5 per cent general and refunding mortgage, gold, series A, due New York Dec. 1, 1951; Nos. 2088, 2772, 3830, 3840, 3930, 3931, 5222–5224; 9 at $1,000.	9,000.00	8,237.50	7,650.00
*Milwaukee Electric Railway & Light Co. 7½ per cent 20-year refunding and first mortgage, gold, series A, due June 1, 1941; No. D890; 1 at $500	500.00	475.00	505.00
Minneapolis General Electric Co. 5 per cent 30-year gold mortgage, due New York Dec. 1, 1934; Nos. 1621, 1622, 1949, 2004, 2572–2575, 7579, 7580; 10 at $1,000	10,000.00	9,880.00	9,700.00
*Nevada-California Electric Corporation 6 per cent first lien, series A, due Jan. 1, 1946, New York; 1 at $1,000; No. M409	1,000.00	950.00	935.00
*Nevada-California Electric Corporation 6 per cent first lien, gold, series B, due New York, Oct. 1, 1950; 1, at $500; No. D166	500.00	475.00	467.50
*New York Telephone Co., 6 per cent, 20-year, refunding mortgage, gold, series A, due Oct. 1, 1941; No. 9018; 1, at $500	500.00	485.00	520.00
Niagara Falls Power Co., first mortgage, 5 per cent, gold, coupon, due Jan. 1, 1932; Nos. 5246, 5247, 6583, 8358; 4, at $1,000	4,000.00	4,100.00	3,960.00
Niagara Falls Power Co., first mortgage, 5 per cent, gold, registered, due Jan. 1, 1932; No. R484; 1, at $6,000	6,000.00	5,760.00	5,940.00
Riggs Realty Co., 3–30-year coupon, first, 5 per cent, due Washington, D. C., Oct. 1, 1940; Nos. 136, 140, 144; 3, at $1,000	3,000.00	3,097.50	2,760.00
Shawinigan Water & Power Co., 5 per cent, consolidated mortgage, 30-year, gold, due Jan. 1, 1934; Nos. MO354, MO510, M2894, M2943; 4, at $1,000	4,000.00	3,822.50	3,900.00
Southern Bell Telephone & Telegraph Co., 30-year, first mortgage, 5 per cent, sinking fund, gold, due Jan. 1, 1941; Nos. M9739, M11576–M11579, M13965, M15568–M15570; 9, at $1,000	9,000.00	8,942.50	8,460.00
*State of Queensland, 20-year, 7 per cent, sinking fund, external loan, gold, due Oct. 1, 1941; Nos. 8224–8231; 8, at $1,000	8,000.00	7,940.00	8,650.00
Swiss Government, 8 per cent, due July 1, 1940; No. 3400; 1 at $1,000	1,000.00	1,000.00	1,187.50
Trinity Buildings Corporation, first mortgage, gold, 5½ per cent, due 1939; Nos. M5229–M5243; 15, at $1,000; and Nos. D697–D706; 10, at $500	20,000.00	19,900.00	19,600.00
Two Rector Street Corporation, first mortgage, 15-year, sinking fund, gold loan, 6 per cent, due Apr. 1, 1935; No. M300; 1, at $1,000; No. D152, 1, at $500	1,500.00	1,500.00	1,470.00
Union Electric Light & Power Co., of St. Louis, 5 per cent, first mortgage, 30-year, gold, due New York, Sept. 1, 1932; Nos. 1352, 4169, 8601, 3821; 4, at $1,000	4,000.00	3,782.50	3,720.00

Statement of assets and liabilities, June 30, 1922—Continued.

ASSETS—Continued.

	Face value.	Book value.	Market value, June 30, 1922.
Bonds—Continued.			
United Kingdom of Great Britain and Ireland, ten year, 5½ per cent, due Aug. 1, 1929; Nos. M138584-M138599; 16, at $1,000	$16,000.00	$15,400.00	$17,240.00
Vicksburg, Shreveport & Pacific R. R. Co., prior-lien mortgage, at 6 per cent, gold, renewed at 5 per cent, due Nov. 1, 1915, extended to Nov. 1, 1940; Nos. 561, 661, 794, 982, 1323; 5 at $1,000	5,000.00	5,050.00	4,400.00
*John Wanamaker, 5 per cent, first mortgage, gold, due Apr. 1, 1923; registered; No. 395; 1, at $1,000	1,000.00	1,000.00	1,000.00
Total	313,400.00	300,931.75	298,052.95
Other United States securities held	12,000.00	12,000.00	12,000.00
Grand total	344,400.00	331,931.75	329,052.95

SUMMARY.

Book value of securities as above	$331,931.75
Accrued interest on securities purchased	75.50
	332,007.25
Bank balance, June 30, 1922	9,459.08
Total	341,466.33

LIABILITIES.

	Income.	Capital.		Income.	Capital.
General fund:			Gibbs fund:		
Invested	$430.00		Invested	$500.00	$5,545.50
Uninvested	1,558.05		Uninvested	349.16	
Agassiz fund:			Gould fund:		
Invested		$50,000.00	Invested	7,170.00	19,752.50
Uninvested			Uninvested	2,110.03	247.50
Bache fund:			Hale lectureship:		
Invested		60,000.00	Invested	200.00	
Uninvested	948.58		Uninvested	53.33	
Billings fund: Invested	50.00	21,750.00	Hartley fund:		
Building site:			Invested		1,200.00
Invested	2,757.50		Uninvested	193.36	
Uninvested	355.62		Henry fund:		
Comstock fund:			Invested		$39,739.57
Invested	500.00	12,168.75	Uninvested	$2,270.67	
Uninvested	2,231.86	237.27	Marsh fund:		
Consolidated fund: Uninvested	1,746.16		Invested	150.00	20,000.00
Draper fund:			Uninvested	829.27	
Invested	917.50	10,000.00	Murray fund:		
Uninvested	779.66		Invested	400.00	6,000.00
Elliot fund:			Uninvested	1,109.09	
Invested	300.00	8,000.00	Proceedings:		
Uninvested	678.56		Academy account, uninvested	1,678.29	

Statement of assets and liabilities, June 30, 1922—Continued.

LIABILITIES—Continued.

	Income.	Capital.		Income.	Capital.
Proceedings—Continued.			Watson fund:		
Joint account, uninvested	$2,014.24		Invested	$1,780.00	$24,663.75
Emergency fund proceedings:			Uninvested	1,333.08	336.25
Invested	1,870.00		Total	41,825.24	299,641.09
Uninvested	196.11		Consolidated investment fund:		
Smith fund:			Invested		232,219.25
Invested	2,542.50	$10,000.00	Uninvested	1,746.16	15.82
Uninvested	1,645.66			1,746.16	232,235.07
Thompson fund:					
Invested		10,000.00			
Uninvested	176.96				

Condensed statement of receipts and expenditures, July 1, 1921, to June 30, 1922

RECEIPTS.

Balance July 1, 1921, as per last report		$21,280.50
Cash receipts:		
Academy proceedings—		
Annual dues	$1,017.50	
Subscriptions	188.45	
Reprints and separates	157.09	
Special contributions secured by Dr. Chas. D. Walcott	50.00	
Contribution by William Ellery Hale fund	1,000.00	
		$2,413.04
Joint proceedings—		
Subscriptions	705.40	
Reprints and separates	407.47	
National Research Council	2,500.00	
		3,612.87
General fund, annual dues		855.00
Building construction fund, contribution by Carnegie Corporation of New York		46,190.74
Joseph Henry fund, from Pennsylvania Co. for Insurance on Lives and Granting Annuities		18,850.98
Billings fund, from the estate of Mrs. Mary Anna Palmer Draper		16,750.00
Total income from investments		17,519.47
Mortgage notes paid		2,500.00
Bonds called and sold		10,798.50
Profit on sale of bonds		220.44
Sale of United States Treasury certificates		10,051.37
		129,762.41
Book transfers, distribution of consolidated		10,448.23
Total		161,491.14

EXPENDITURES.

Book transfers, distribution of consolidated			$10,448.23
Cash expenditures:			
Building construction fund, for plans and services		$46,190.74	
Building site fund, blue prints, plats, and photos		226.50	
General fund—			
Salary, assistant secretary	$900.00		
Home secretary's office	1,076.54		
Treasurer's office	211.60		
Meetings—			
Annual	$800.46		
Autumn	243.81		
	1,044.27		
Election of members	124.51		
		3,356.92	
Academy proceedings, printing and distributing	54.08		
		54.08	
Joint proceedings—			
Salary, managing editor	750.00		
Printing and distributing	5,055.35		
Expenses—			
Boston office	174.25		
Washington office	96.45		
		6,076.05	
Investment of capital		53,486.25	
Accrued interest on bonds purchased		583.52	
Purchase of United States Treasury certificates and interest		23,686.87	
			133,660.93
Payments from trust and other funds:			
Bache fund—			
Frank P. Underhill and Lafayette B. Mendel grant	$800.00		
Preston Edwards grant	750.00		
T. H. Goodspeed grant	80.00		
Herbert M. Evans grant	500.00		
H. Nort grant	200.00		
Herbert S. Jennings grant	300.00		
H. W. Norris grant	300.00		
Carl Hartman grant	500.00		
		3,430.00	
Draper fund, W. W. Campbell grant		450.00	
Elliot fund, Othenio Abel, grant and medal		428.00	
Henry fund, Ales Hrdlicka grant		500.00	
Marsh fund—			
C. W. Gilmore grant	400.00		
M. Ferdinand Canu grant	400.00		
Carl O. Dunbar grant	65.42		
W. J. Sinclair grant	300.00		
Winifred Goldring grant	75.00		
Rudolph Ruedemann grant	200.00		
		1,440.42	

Payments from trust and other funds—Continued.			
Smith fund—			
Stuart R. Brinkley grant	$300.00		
Charges on medal	5.58		
		$305.58	
Thompson fund, designing medal, etc.		268.90	
Watson fund—			
John A. Miller grant	500.00		
William Bowie grant	300.00		
H. C. Wilson grant	300.00		
		1,100.00	
Total payments from trust funds			$7,922.90
			152,032.06
Balance June 30, 1922			9,459.08
Total			161,491.14

Accounts with individual funds, July 1, 1921, to June 30, 1922.

	General fund.		Agassiz fund.	
	Income.	Capital.	Income.	Capital.
Balance July 1, 1921:				
Cash	$973.91			
Invested				$50,000.00
Receipts:				
Interest on investments	3,516.06			
Annual taxes	855.00			
Total	5,344.97			50,000.00
Disbursements, general expenses	3,356.92			
Balance June 30, 1922:				
Cash	1,558.05			
Invested	430.00			50,000.00
Total	5,344.97			50,000.00

	Bache fund.		Billings fund.	
	Income.	Capital.	Income.	Capital.
Balance July 1, 1921:				
Cash	$1,234.39			
Invested		$60,000.00	$50.00	$5,000.00
Receipts:				
Interest on investments	3,144.19		693.57	
Estate of Mary Anna Palmer Draper				16,750.00
Total	4,378.58	60,000.00	743.57	21,750.00
Disbursements:				
Grants	3,430.00			
Transfer to academy proceedings			693.57	
Balance June 30, 1922:				
Cash	948.58			
Invested		60,000.00	50.00	21,750.00
Total	4,378.58	60,000.00	743.57	21,750.00

Accounts with individual funds, July 1, 1921, to June 30, 1922—Continued.

	Building construction.		Building site.	
	Income.	Capital.	Income.	Capital.
Balance July 1, 1921:				
Cash			$479.95	
Invested			2,240.00	
Receipts:				
Interest on investments			625.00	
Carnegie Corporation of New York	$46,190.74			
Total	46,190.74		3,344.95	
Disbursements:				
Plans and services	46,190.74			
Blue prints, plats, photos			226.50	
Accrued interest from bonds purchased			5.33	
Balance June 30, 1922:				
Cash			355.62	
Invested			2,757.50	
Total	46,190.74		3,344.95	

	Comstock fund.		Consolidated fund.	
	Income.	Capital.	Income.	Capital.
Balance July 1, 1921:				
Cash	$1,601.68	$141.02	$1,310.25	$1,517.75
Invested	500.00	12,265.00		174,227.75
Receipts:				
Interest on investments	628.18		11,149.47	
Profit on sale of bonds	2.00		186.69	
Capital transfer (Henry)				39,739.57
Capital transfer (Billings)				16,750.00
Total	2,731.86	12,406.02	12,646.41	232,235.07
Disbursements:				
Distribution of consolidated			10,448.23	
Accrued interest on bonds purchased			452.02	
Balance June 30, 1922:				
Cash	2,231.86	237.27	1,746.16	15.82
Invested	500.00	12,168.75		232,219.25
Total	2,731.86	12,406.02	12,646.41	232,235.07

Accounts with individual funds, July 1, 1921, to June 30, 1922—Continued.

	Draper fund.		Elliot fund.	
	Income.	Capital.	Income.	Capital.
Balance July 1, 1921:				
Cash	$655.66	.....	$674.96	.....
Invested	917.50	$10,000.00	300.00	$8,000.00
Receipts, interest on investments	574.00	.....	431.60	.....
Total	2,147.16	10,000.00	1,406.56	8,000.00
Disbursements, grants and medals	450.00	.....	428.00	.....
Balance June 30, 1922:				
Cash	779.66	.....	678.56	.....
Invested	917.50	10,000.00	300.00	8,000.00
Total	2,147.16	10,000.00	1,406.56	8,000.00

	Gibbs fund.		Gould fund.	
	Income.	Capital.	Income.	Capital.
Balance July 1, 1921:				
Cash	$36.89	.....	$897.72	$2,007.50
Invested	500.00	$5,545.50	7,010.00	17,992.50
Receipts:				
Interest on investments	312.27	.....	1,436.34	.....
Profit on sale of bonds	.....	.....	27.75	.....
Total	849.16	5,545.50	9,371.81	20,000.00
Disbursements: Accrued interest on bonds purchased	.....	.....	91.78	.....
Balance June 30, 1922:				
Cash	349.16	.....	2,110.03	247.50
Invested	500.00	5,545.50	7,170.00	19,752.50
Total	849.16	5,545.50	9,371.81	20,000.00

	Hale lectureship.		Hartley fund.	
	Income.	Capital.	Income.	Capital.
Balance July 1, 1921:				
Cash	$44.83	.....	$130.68	.....
Invested	200.00	.....	.....	$1,200.00
Receipts: Interest on investments	8.50	.....	62.68	.....
Total	253.33	.....	193.36	1,200.00
Balance June 30, 1922:				
Cash	53.33	.....	193.36	.....
Invested	200.00	.....	.....	1,200.00
Total	253.33	.....	193.36	1,200.00

Accounts with individual funds, July 1, 1921, to June 30, 1922—Continued.

	Henry fund.		Marsh fund.	
	Income.	Capital.	Income.	Capital.
Balance July 1, 1921:				
Cash			$1,215.09	
Invested			150.00	$20,000.00
Receipts:				
Interest on investments	$1,459.26		1,054.60	
From Pennsylvania Company, for insurance on lives and granting annuities	1,311.41	$39,739.57		
Total	2,770.67	39,739.57	2,419.69	20,000.00
Disbursements: Grants	500.00		1,440.42	
Balance June 30, 1922:				
Cash	2,270.67		829.27	
Invested		39,739.57	150.00	20,000.00
Total	2,770.67	39,739.57	2,419.69	20,000.00

	Murray fund.		Smith fund.	
	Income.	Capital.	Income.	Capital.
Balance July 1, 1921:				
Cash	$777.23		$1,288.49	
Invested	400.00	$6,000.00	2,542.50	$10,000.00
Receipts: Interest on investments	331.86		662,75	
Total	1,509.09	6,000.00	4,493.74	10,000.00
Disbursements: Grants and medals			305.58	
Balance June 30, 1922:				
Cash	1,109.09		1,645.66	
Invested	400.00	6,000.00	2,542.50	10,000.00
Total	1,509.09	6,000.00	4,493.74	10,000.00

	Academy proceedings.		Joint proceedings.	
	Income.	Capital.	Income.	Capital.
Balance July 1, 1921, cash	$1,125.76		$1,977.42	
Receipts:				
Subscriptions	188.45		705.40	
Annual dues	1,017.50			
Reprints and separates	157.09		407.47	
Transfer from Billings fund	693.57			
Special contributions secured by Dr. Chas. D. Walcott	50.00			
Contribution by William Ellery Hale fund	1,000.00			
Contribution by National Research Council			2,500.00	
Transferred from academy proceedings to joint proceedings representing contribution by National Academy of Sciences			2,500.00	
Total	4,232.37		8,090.29	

Accounts with individual funds, July 1, 1921, to June 30, 1922—Continued.

	Academy proceedings.		Joint procedings-	
	Income.	Capital.	Income.	Capital.
Disbursements:				
Salary of managing editor			$750.00	
Printing and distributing	$54.08		5,055.35	
Expenses, Boston office			174.25	
Expenses, Washington office			96.45	
Transferred from academy proceedings to joint proceedings representing contributions by National Academy of Sciences	2,500.00			
Balance June 30, 1922, cash	1,678.29		2,014.24	
Total	4,232.37		8,090.29	

	Emergency-fund proceedings.		Thompson fund.	
	Income.	Capital.	Income.	Capital.
Balance July 1, 1921:				
Cash	$2,040.00		$20.86	
Invested				$10,000.00
Receipts, interest on investments	50.00		425.00	
Total	2,090.00		445.86	10,000.00
Disbursements:				
Accrued interest on bonds purchased	23.89			
Designing of medal, etc			245.00	
Charges on medal			23.90	
Balance June 30, 1922:				
Cash	196.11		176.96	
Invested	1,870.00			10,000.00
Total	2,090.00		445.86	10,000.00

	Watson fund.	
	Income.	Capital.
Balance July 1, 1921:		
Cash	$1,104.71	$23.75
Invested	1,780.00	24,976.25
Receipts:		
Interest on investments	1,402.37	
Profits on sale of bonds	4.00	
Total	4,291.08	25,000.00
Disbursements:		
Grants	1,100.00	
Accrued interest on bonds purchased	10.50	
Loss on sale of bonds	67.50	
Balance June 30, 1922:		
Cash	1,333.08	336.25
Invested	1,780.00	24,663.75
Total	4,291.08	25,000.00

NATIONAL RESEARCH COUNCIL.

During the fiscal year ended June 30, 1922, the activities of the National Research Council were supported by funds derived from various sources. The following list gives the main sources of these funds:

(1) For general maintenance expenses of the National Research Council the sum of $185,000 was received from the Carnegie Corporation of New York.

(2) From the Rockefeller Foundation the following amounts were received for the special purposes indicated: For the division of physical sciences, $6,679.17; for national research fellowships, year 1921 (R. F. 2517), $32,941.81, and for the same purpose, year 1922 (R. F. 2608), $42,266.51; for fellowships in medicine (R. F. 2632), $231.85; for the rehabilitation of Concilium Bibliographicum, year 1921, $15,000; and for the same purpose, year 1922, $15,000.

(3) From the General Education Board contributions were received as follows: For special work carried on by the division of educational relations, $2,500, and for fellowships in medicine, $231.84.

(4) From various organizations for the advisory board on highway research, $14,000.

(5) From various organizations, chiefly railroads, for marine piling investigations, $15,797.

(6) From the Chemical Foundation: For special work by the research information service, $7,500, and for standardization of biological stains, $500.

(7) Other contributions included: The sum of $2,000 from Julius Rosenwald toward the support of a fellowship in biology; from the Corning Glass Works toward the support of a fellowship in ceramics, $1,000; from the Southern Pine Association for the use of the committee on forestry, $3,000; from various organizations, for the use of the food and nutrition committee, $1,350; from Glass Containers' Association of America, for an investigation of food products, $568.28; from various individuals, for international language, $950; from Theodore Lyman, special contribution for physical and chemical constants, $1,000; from various sources, for the committee on substitute deoxidizers, $400; for the use of the committee on atmosphere and man, $1,000; for expenses of chemical exhibits, $8,317.40; for motion-picture films, chemical exhibits, $1,500; for conference on sex research, $1,000; for national intelligence tests, $1,602.07; for trustees for the publication of physical and chemical constants, $13,736.73.

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Receipts and disbursements, National Research Council, from July 1, 1921, to June 30, 1922.

RECEIPTS.

July 1, 1921, cash in bank		$5,898.32
Appropriations:		
Rockefeller Foundation—		
Physical sciences (R. F. 2518)	$6,679.17	
National Research fellowships (R. F. 2517)	32,941.81	
National Research fellowships (R. F. 2608)	42,266.51	
Fellowships in medicine (R. F. 2632)	231.85	
Concilium Bibliographicum (1921)	15,000.00	
Concilium Bibliographicum (1922)	15,000.00	
General Education Board—		
Division of educational relations	2,500.00	
Fellowships in medicine	231.84	
Carnegie Corporation of New York	185,000.00	
Rosenwald fellowships	2,000.00	
Research fellowships in ceramics supported by Corning Glass Works	1,000.00	
Chemical Foundation—		
For special work by research information service	7,500.00	
For standardization of biological stains	500.00	
Food and nutrition committee	1,350.00	
Food products investigation fund	568.28	
Committee on forestry	3,030.00	
Receipts from subscriptions, Concilium Bibliographicum	294.02	
Marine piling investigations	15,797.00	
International auxiliary language	950.00	
Advisory board on highway research	14,000.00	
Committee on substitute deoxidizers	400.00	
Committee on the atmosphere and man	1,000.00	
Trustees for the publication of physical and chemical constants	13,736.73	
Sale of United States Treasury certificates	3,510.04	
Interest on United States Treasury certificates	665.04	
Expenses of chemical exhibits	8,317.40	
Motion picture films chemical exhibit	1,500.00	
Conference on sex research	1,000.00	
National intelligence tests	1,602.07	
Special contribution of Theodore Lyman	1,000.00	
Unappropriated fund, special, interest on investments	158.48	
Sale of United States Treasury certificates	105,780.92	
Interest on United States Treasury certificates	4,320.14	
Miscellaneous receipts	28,450.56	
Reimbursements	13,460.22	
		531,742.08
		537.640.40

DISBURSEMENTS.

Divisions:	
I. Federal relations, general maintenance, 1922	
II. Foreign relations—	
General maintenance, 1922	$257.68
Foreign dues	39.61
III. States relations—	
General maintenance, 1921	290.12
General maintenance, 1922	1,032.77
IV. Educational relations—	
General maintenance, 1922	411.72
General Education Board	2,397.42
V. Research extension—	
General maintenance, 1921	26.50
General maintenance, 1922	1,642.17
Expenses of chemical exhibit, 1922	8,317.40
Motion-picture films chemical exhibit	1,500.00
Special contribution of Theodore Lyman	1,000.00
VI. Research information service—	
General maintenance, 1921	124.17
General maintenance, 1922	2,362.13
Contingent expenses, 1921	395.75
Equipment, 1921	331.57
Equipment, 1922	3,769.74
National Academy, proceedings and subscriptions, 1922	2,500.00
Geological bibliography, 1922	250.00
System of classification, 1922	550.00
Biological bibliography, 1922	272.65
Survey of informational resources, 1922	579.49
Special travel, 1922	47.78
VII. Physical sciences—	
General maintenance, 1922	1,894.04
Revolving fund for publication of mathematical books, 1922	250.00
Rockefeller Foundation (R. F. 2518), travel expenses	10,632.65
Special fund, 1922	100.00
Refunds	1,223.64
Traveling expenses American section International Astronomical Union, 1922	493.16
Traveling expenses American section International Union of Scientific Radio Telegraphy, 1922	700.00
VIII. Engineering—	
General maintenance, 1921	152.82
General maintenance, 1922	1,690.57
Office expenses, 1922	520.41
Projects, 1921	1,748.41
Advisory board on highway research, 1922	13,039.73
Marine piling investigations, 1922	6,067.57
Marine piling investigations restricted, 1922	353.73

Divisions—Continued.

IX. Chemistry and chemical technology—	
General maintenance, 1921	$10.50
General maintenance, 1922	764.18
International auxiliary language	887.51
Research fellowships (R. F. 2517), 1921	37,947.13
Research fellowships (R. F. 2608) 1922	40,061.01
Research fellowships, in ceramics, supported by Corning Glass Works	1,000.00
Trustees for the publication of physical and chemical constants	2,121.92
Purchase of United States Treasury certificates	16,534.38
Projects	250.00
Traveling expenses, Union of Pure and Applied Chemistry, 1922	800.00
X. Geology and geography—	
General maintenance, 1922	756.52
Projects	750.00
Antevs project, 1922	500.00
Traveling expenses International Geology Congress, 1922	400.00
XI. Medical Sciences—	
General maintenance, 1922	1,054.83
International Association of Medical Museums, 1921	500.00
Study of empyema, 1921–22	392.30
Conference on contagious abortion in animals, 1921–22	250.00
Conference on sex research, 1922	1,000.00
Study of the tuberculosis death certificates in Colorado, 1922	886.00
Fellowships in medicine, 1922	1,023.40
XII. Biology and agriculture—	
General maintenance, 1921	58.47
General maintenance, 1922	3,064.80
Botanical abstracts, 1921	2,245.82
Committee on forestry	4,296.31
Food and nutrition committee	865.12
Food products investigation fund	856.71
Physiological salt requirements committee, 1921	251.63
Committee on fertilizers and committee on plant nutrition, 1922	78.78
Research in tropical America, 1922	156.12
Rosenwald fellowship	2,000.00
Committee on standardization of biological stains	495.76
Committee on the atmosphere and man, 1922	602.70
Biological relation of insects to flowers, 1922	39.67
Conference on federation of American biological societies, 1922	500.00
Rust project, 1922–23	38.80

Divisions—Continued.		
XIII. Anthropology and psychology—		
General maintenance, 1921	$16.92	
General maintenance, 1922	1,783.90	
American archæological project, 1921	267.20	
Psychological projects, 1921	1,000.00	
National intelligence tests, 1921	200.00	
Funds for vestibular research, 1921	400.00	
Committee on vestibular research, 1922	628.58	
Executive board—		
General maintenance, 1920	48.64	
General maintenance, 1921	25.01	
General maintenance, 1922	2,292.46	
American Geophysical Union—		
General maintenance, 1921	10.75	
General maintenance, 1922	325.38	
Traveling expenses, 1922	1,200.00	
Publicity committee—		
General maintenance, 1921	35.00	
Publications, 1921	2,479.95	
Publications and publicity—		
General maintenance, 1922	4,869.22	
Concilium Bibliographicum	15,000.00	
Concilium Bibliographicum, 1922	14,827.04	
Committee on Concilium Bibliographicum, 1922	250.00	
Receipts from subscriptions Concilium Bibliographicum	294.02	
Committee on conservation, 1921	357.01	
Scientific Instrument Journal, 1922	2,389.90	
American committee to aid European scientists, 1922	131.60	
Auditors' fees, 1921	150.00	
Contingent expenses, 1922	870.42	
Electricity, 1922	765.05	
Expenses and supplies, 1921	425.50	
Expenses and supplies, 1922	4,162.16	
Fuel, 1922	1,205.45	
New equipment, general, 1922	1,348.81	
Rent, 1922	6,875.00	
Rent, 1923	625.00	
Salaries, 1922	140,660.00	
Telephone and telegraph, 1921	117.43	
Telephone and telegraph, 1922	1,238.51	
Unappropriated project fund, 1922	120.00	
Purchase of United States Treasury certificates	111,263.75	
Total		$509,065.43
June 30, 1922, cash in bank:		
American Security & Trust Co., research fellowships	1,645.79	
Riggs National Bank, various accounts	26,929.18	
		28,574.97
		537,640.40

F. L. RANSOME, *Treasurer.*

JULY 28, 1922.

REPORT OF THE AUDITING COMMITTEE.

WASHINGTON, D. C., *July 31, 1922.*

We have employed the Capital Audit Co. to scrutinize and report on the treasurer's books. We accepted the certificate, dated July 1, 1922, of the American Security & Trust Co. regarding notes owned by the academy and deposited for collection; we have examined the securities owned by the academy and papers contained in the box of the National Academy of Sciences at the vault of the American Security & Trust Co. We find them to correspond to the list checked by the auditing committee on July 17, 1922, except as modified by transactions since July 1, 1922, reported by the Capital Audit Co. We find that the coupons falling due during this period have been cut and accounted for, and those due July 1, 1922, have been deposited and are accounted for by appropriate entries in the pass book. We find that interest on loans has been accounted for. Correspondence between vouchers, pass books, and accounts of the treasurer is certified by the Capital Audit Co. We find the net balance reported by the treasurer as of June 30, 1922, to accord with the statement of the American Security & Trust Co. and with the check book. The above paragraph relates to the accounts of the National Academy of Sciences proper.

The Capital Audit Co. has made a special report on the accounts of the National Research Council, whose funds are deposited in two separate accounts to the credit of the academy. We have examined the long-term securities of the National Research Council deposited in the box at the American Security & Trust Co. and find them correct. We accepted the certificate, dated June 30, 1922, of the Riggs National Bank as to United States Treasury certificates of indebtedness owned by the National Research Council and held by the bank for collection. We find that the net balance reported by the treasurer as of June 30, 1922, agrees with the statements of the American Security & Trust Co. and the Riggs National Bank for these accounts. Correspondence between vouchers, pass books, and accounts of the treasurer for the National Research Council is certified by the Capital Audit Co.

WHITMAN CROSS,
DAVID WHITE,
L. O. HOWARD,
Auditing Committee.

JOHN CASPER BRANNER.

[From Science, New Series, vol. 55, No. 1422, March 31, 1922, pp. 340-341.]

John Casper Branner, geologist and president emeritus of Stanford University, was born in Newmarket, Tenn., July 4, 1850, and died in Palo Alto, Calif., on March 1, 1922. He entered Cornell University in 1870, soon after its organization, graduating in 1874 as bachelor of science, subsequently receiving the degree of Ph. D. from Indiana University and that of LL. D. from the University of California. In 1883 he married Susan D. Kennedy, of Oneida, N. Y., and left three children: John K., architect, George C., geologist-philosopher, and Elsie, Mrs. Frederick Hall Fowler.

His advanced work at Cornell was under a great teacher of geology, Charles Frederick Hartt, who (during vacations) acted as imperial geologist of Brazil. Thus with Orville A. Derby, Richard Rathbun, Herbert H. Smith, and other student assistants, Branner went to Brazil, where, upon the death of Hartt in 1875, he became director of the imperial geological commission. Afterwards, Brazil having become a Republic, he entered the service of the Sao Cyriaco Mining Co. at Minas Geraes as engineer and interpreter. Later he again went to Brazil and to Argentina as special botanist for Thomas A. Edison in search of wood fitted for certain electrical uses, and still later represented the United States Department of Agriculture in the former country. Returning to America in 1883, he served as topographical geologist of the survey of Pennsylvania, a position resigned to accept that of professor of geology in the University of Indiana, where his college friend, the present writer, had just been appointed president. In 1891 he entered the faculty of the newly founded Stanford University as professor of geology, later becoming vice president of the institution. In 1913, when the title of chancellor was created for me that I might be free for public service, he was elected president of the university, and held that office up to his retirement as emeritus in 1917.

Branner directed three scientific expeditions to Brazil: One under the patronage of Alexander Agassiz in 1899; one in 1907 supported by Richard A. F. Penrose, a former assistant professor at Stanford; and a third in 1911 for the Brazilian Government. This last made a geological and biological study of the coast north and south of the mouth of the Amazon River, the especial purpose being to determine the effect of the great volume of fresh water brought into the ocean by the Amazon upon the marine life of the ocean.

His publications include a volume on the geology of Brazil, with a large number of special papers, and a grammar of the Portuguese language. His other memoirs on geology and physical geography

are very numerous; his Bibliography of Clays and Arts isan important contribution to that subject.

Branner was a fellow of the Geological Society of America, a member of the Geological Society of London, of the Société Géologique de France, the National Academy of Sciences, the American Philosophical Society. He was also a member and for a time president of the American Seismological Society, and associate editor of the Journal of Geology. In 1906 he was appointed to the California earthquake commission, and in 1915 served the United States Government on the commission to investigate the land slides on the Panama Canal.

In 1911 the Hayden medal was conferred upon him by the Academy of Natural Science of Philadelphia, "in recognition of the value of contributions to geological science, and of the benefits derived from his able and conscientious discharge of the official trusts confided to him."

In 1912 he published "How and Why Stories," a delightful collection of tales told by negroes in Tennessee, bearing on the episodes of creation—"how the snake lost his legs," and the like—quite worthy of place beside the Georgia tales of "Uncle Remus."

In person Branner was robust and vigorous, six feet in height and well proportioned, a man of attractive personality and excellent address. In college he was noted for his dry humor, unfailing readiness, and good nature. As a teacher he was singularly successful in training men to thorough and accurate dealing with problems of geology and mining, gaining the personal love and confidence of his students. Among his disciples are many of high standing in the profession: Herbert Hoover, Robert V. Anderson, Frank M. Anderson, Ralph Arnold, George H. Ashley, Carl H. Beal, Willis S. Blatchley, W. J. Crook, H. W. Durrell, Noah F. Drake, Frank L. Hess, Theodore L. Hoover, J. M. Hyde, D. S. Kimball, E. M. Kindle, Newton B. Knox, Henry Landes, Deane P. Mitchell, James H. Means, John F. Newsom, Frederick W. Nobs, Edward H. Nutter, W. A. Pritchard, A. H. Purdue, Milnor Roberts, Hugh Rose, Claude Siebenthal, E. K. Soper, Herbert S. Stark, Stephen Taber, Frederick P. Vickery, Gerald A. Waring, H. E. Williams, Hayes Young, and many others well known in science or mining. The "Branner Club," of Los Angeles, is composed of his students in geology.

I must add a personal word. My acquaintance with Branner covers 52 years, the first two as fellow student and fraternity brother in Delta Upsilon, the next 30 as fellow teacher and coworker in science in Indiana and in California, three more as my successor and colleague in administration of the educational work to which I gave the best 25 years of my life, and, finally, 5 years of retirement from

active responsibility to the congenial work of writing out of the fullness of experience. In all these years he lived up to his motto, "I can get along without the respect of my neighbors, but not without the respect of Number 1." And in maintaining self-respect he won the regard of his neighbors of whatever degree. A righteous life helps to strengthen all who come in contact with it. "There is always room for a man of force and he makes room for many."

DAVID STARR JORDAN.

APPENDIXES.

APPENDIX A.

CONSTITUTION OF THE NATIONAL ACADEMY.

[As amended and adopted April 17, 1872, and further amended April 20, 1875; April 21, 1881; April 19, 1882; April 18, 1883; April 19, 1888; April 18, 1895; April 20, 1899; April 17, 1902; April 18, 1906; November 20, 1906; April 17, 1907; November 20, 1907; April 20, 1911; Apr. 16, 1912; Apr. 21, 1915.]

PREAMBLE.

Empowered by the act of incorporation enacted by Congress, and approved by the President of the United States on the 3d day of March, A. D. 1863, and in conformity with amendments to said act approved July 14, 1870, June 20, 1884, and May 27, 1914, the National Academy of Sciences adopts the following amended constitution and rules:

ARTICLE I.—OF MEMBERS.

SECTION 1. The academy shall consist of members, honorary members, and foreign associates. Members must be citizens of the United States.

SEC. 2. Members who, from age or inability to attend the meetings of the academy, wish to resign the duties of active membership, may, at their own request, be transferred to the roll of honorary members by a vote of the academy.

SEC. 3. The academy may elect 50 foreign associates.

SEC. 4. Honorary members and foreign associates shall have the privilege of attending the meetings and of reading and communicating papers to the academy, but shall take no part in its business, shall not be subject to its assessments, and shall be entitled to a copy of the publications of the academy.

ARTICLE II.—OF THE OFFICERS.

SECTION 1. The officers of the academy shall be a president, a vice president, a foreign secretary, a home secretary, and a treasurer, all of whom shall be elected for a term of four years, by a majority of votes present, at the first stated meeting after the expiration of the current terms, provided that existing officers retain their places until their successors are elected. In case of a vacancy, the election for four years shall be held in the same manner at the meeting when such

vacancy occurs, or at the next stated meeting thereafter, as the academy may direct. A vacancy in the office of treasurer or home secretary may, however, be filled by appointment of the president of the academy until the next stated meeting of the academy.

SEC. 2. The officers of the academy, together with six members to be elected by the academy, shall constitute a council for the transaction of such business as may be assigned to them by the constitution or the academy.

SEC. 3. The president of the academy, or, in case of his absence or inability to act, the vice president, shall preside at the meetings of the academy and of the council; shall name all committees except such as are otherwise especially provided for; shall refer investigations required by the Government of the United States to members especially conversant with the subjects and report thereon to the academy at its meeting next ensuing; and, with the council, shall direct the general business of the academy.

It shall be competent for the president, in special cases, to call in the aid, upon committees, of experts or men of special attainments not members of the academy.

The president shall be, ex officio, a member of all committees empowered to consider questions referred to the academy by the Government of the United States.

SEC. 4. The foreign and home secretaries shall conduct the correspondence proper to their respective departments, advising with the president and council in cases of doubt, and reporting their action to the academy at one of the stated meetings in each year.

It shall be the duty of the home secretary to give notice to the members of the place and time of all meetings, of all nominations for membership, and of all proposed amendments to the constitution.

It shall be the duty of the home secretary to keep the minutes of each business and scientific session, and after approval to enter these upon the permanent records of the academy.

SEC. 5. The treasurer shall attend to all receipts and disbursements of the academy, giving such bond and furnishing such vouchers as the council may require. He shall collect all dues, assessments, and subscriptions, and keep a set of books showing a full account of receipts and disbursements and the condition of all funds of the academy. He shall be the custodian of the corporate seal of the academy.

ARTICLE III.—OF THE MEETINGS.

SECTION 1. The academy shall hold one stated meeting, called the annual meeting, in April of each year in the city of Washington, and another stated meeting, called the autumn meeting, at a place to be determined by the council. The council shall also have power to fix the date of each meeting.

Special business meetings of the academy may be called, by order of eight members of the council, at such place and time as may be designated in the call.

Special scientific meetings of the academy may be held at times and places to be designated by a majority of the council.

SEC. 2. The names of the members present at each session of a meeting shall be recorded in the minutes, and 20 members shall constitute a quorum for the transaction of business.

SEC. 3. Scientific sessions of the academy, unless otherwise ordered by a majority of the members present, shall be open to the public; sessions for the transaction of business shall be closed.

SEC. 4. Stated meetings of the council shall be held during the stated or special meetings of the academy, and four members shall constitute a quorum for the transaction of business. Special meetings of the council may be convened at the call of the president and two members of the council, or of four members of the council.

SEC. 5. No member whose dues are in arrears shall vote at any business meeting of the academy.

ARTICLE IV.—OF ELECTIONS AND REGULATIONS.

SECTION 1. All elections of officers and members shall be by ballot, and each election shall be held separately.

SEC. 2. The time for holding an election of officers shall be fixed by the academy at least one day before the election is held.

SEC. 3. The election of six members of the council shall be as follows:

At the annual meeting in April, 1907, six members of the council to be elected, of whom two shall serve for three years, two for two years, and two for one year, their respective terms to be determined by lot. Each year thereafter the terms of two members shall expire, and their successors, to serve for three years, shall be elected at the annual meeting in each year.

SEC. 4. The academy shall be divided by the council into sections representing the principal branches of scientific research. Each section shall elect its own chairman, who shall serve for three years. the chairman shall be responsible to the academy for the work of his section.

Nominations to membership in the academy shall be made in writing and approved by a majority of the members of the section on the branch of research in which the person nominated is eminent, or by a majority of the council in case there is no section on the subject. The nomination shall be sent to the home secretary by the chairman of the section before January 1 of the year in which the election is to be held, and each nomination shall be accompanied by a list of the principal contributions of the nominee to science. This list shall

be printed by the home secretary for distribution among the members of the academy.

SEC. 5. Election of members shall be held at the annual meeting in Washington in the following manner: There shall be two ballots—a preference ballot, which may be prepared either before or at the annual meeting, and must be transmitted to the home secretary, and a final ballot, to be taken at the meeting.

Preference ballot.—Each member may inscribe on a ballot not more than 15 names of nominees selected from the submitted list. A list of the nominees shall then be prepared, on which the names shall be entered in the order of the number of votes received by each. In case two or more nominees have the same number of votes on this preference list, the order in which they shall be placed on the list shall be determined by a majority vote of members present.

Final ballot.—A vote shall first be taken on the nominee who appears first on the preference list, and he shall be declared elected if he receive two-thirds of the votes cast and not less than 25 votes in all. A vote shall then be taken in similar manner on the nominee standing second on the preference list, and so on until all the nominees on the preference list shall have been acted on, or until 15 nominees shall have been elected, or until the total membership of the academy shall have reached 250.

Not more than 15 members shall be elected at one annual meeting.

Before and during elections a discussion of the merits of nominees will be in order.

SEC. 6. Every member elect shall accept his membership, personally or in writing, before the close of the next stated meeting after the date of his election. Otherwise, on proof that the secretary has formally notified him of his election, his name shall not be entered on the roll of members.

SEC. 7. Foreign associates may be nominated by the council and may be elected at the annual meeting by a two-thirds vote of the members present.

SEC. 8. A diploma, with the corporate seal of the academy and the signatures of the officers, shall be sent by the appropriate secretary to each member on his acceptance of membership, and to foreign associates on their election.

SEC. 9. Resignations shall be addressed to the president and acted on by the academy.

SEC. 10. Whenever a member has not paid his dues for four successive years, the treasurer shall report the fact to the council, which may report the case to the academy with the recommendation that the person thus in arrears be declared to have forfeited his membership. If this recommendation be approved by two-thirds of the members present, the said person shall no longer be a member of the academy and his name shall be dropped from the roll.

ARTICLE V.—SCIENTIFIC COMMUNICATIONS, PUBLICATIONS, AND REPORTS.

SECTION 1. Communications on scientific subjects shall be read at scientific sessions of the academy, and papers by any member may be read by the author or by any other member, notice of the same having been previously given to the secretary.

SEC. 2. Any member of the academy may read a paper from a person who is not a member, and shall not be considered responsible for the facts or opinions expressed by the author, but shall be held responsible for the propriety of the paper.

Persons who are not members may read papers on invitation of the council or of the committee of arrangements.

SEC. 3. The academy may provide for the publication, under the direction of the council, of proceedings, scientific memoirs, biographical memoirs, and reports.

The proceedings shall include the transcations of the academy, brief original announcements of the results of scientific investigations made by members of the academy or others, together with short original articles giving a comprehensive survey of the more important scientific researches currently made by American investigators, and other matters of general scientific interest.

The scientific memoirs shall provide opportunity for the publication of longer and more detailed scientific investigations.

The biographical memoirs shall contain an appropriate record of the life and work of the deceased members of the academy.

An annual report shall be presented to Congress by the president and shall contain the annual reports of the treasurer and the auditing committee, a suitable summary of the reports of the committees in charge of trust funds, and a record of the activities of the academy for the calendar year immediately preceding, and other appropriate matter. This report shall be presented to Congress by the president after authorization by the council. It shall also be presented to the academy at the annual meeting next following.

The treasurer shall prepare a full report of the financial affairs of the academy at the end of the fiscal year. This report shall be submitted to the council for approval and afterwards presented to the academy at the next stated meeting. He shall also prepare a supplementary financial statement to December 31 of the ensuing fiscal year for presentation at the annual meeting.

SEC. 4. Propositions for investigations or reports by the academy shall be submitted to the council for approval, except those requested by the Government of the United States, which shall be acted on by the president, who will in such cases report their results to the Government as soon as obtained and to the academy at its next following stated meeting.

SEC. 5. The advice of the academy shall be at all times at the disposition of the Government upon any matter of science or art within its scope.

ARTICLE VI.—OF THE PROPERTY OF THE ACADEMY.

SECTION 1. All investments and reinvestments of either principal or accumulations of income of the trust and other funds of the academy shall be made by the treasurer, with the approval of the finance committee, in the corporate name of the academy, in the manner and in the securities designated or specified in the instruments creating the several funds, or, in the absence of such designation or specification, in bonds of the United States or of the several States, or in bonds or notes secured by first mortgages on real estate, in investments legal for savings banks under the laws of Massachusetts or New York, or in other bonds recommended to the treasurer by the fiscal advisers of the academy.

The treasurer may invest the capital of all trust funds of the academy which are not required by the instruments creating such funds to be kept separate and distinct, in a consolidated fund, and shall apportion the income received from such consolidated fund among the various funds composing the same in the proportion that each of said funds shall bear to the total amount of funds so invested; provided, however, that the treasurer shall at all times keep accurate accounts showing the amount of each trust fund, the proportion of the income from the consolidated fund to which it is entitled, and the expenses and disbursements properly chargeable to such fund.

SEC. 2. The council shall at its annual meeting in each year designate one bank or trust company in Washington, D. C., and one in New York City to act, when requested by the treasurer, as the fiscal advisers of the academy.

SEC. 3. The treasurer shall have authority, with the approval of the finance committee, to sell, transfer, convey, and deliver in the corporate name and for the benefit of the academy any stocks, bonds, or other securities standing in the corporate name.

SEC. 4. No contract shall be binding upon the academy which has not been first approved by the council.

SEC. 5. The assessments required for the support of the academy shall be fixed by the academy on the recommendation of the council and shall be payable within the calendar year for which they are assessed.

ARTICLE VII.—OF TRUST FUNDS AND THEIR ADMINISTRATION.

SECTION 1. Devises, bequests, donations, or gifts having for their object the promotion of science or the welfare of the academy may

be accepted by the council for the academy. Before the acceptance of any such trust the council shall consider the object of the trust and all conditions or specifications attaching thereto. The council shall make a report of its action to the academy.

SEC. 2. Medals and prizes may be established in accordance with the provisions of trusts or by action of the academy.

SEC. 3. Unless otherwise provided by the deed of gift, the income of each trust fund shall be applied to the objects of that trust by the action of the academy on the recommendation of a standing committee on that fund.

ARTICLE VIII.—OF ADDITIONS AND AMENDMENTS.

Additions and amendments to the constitution shall be made only at a stated meeting of the academy. Notice of a proposition for such a change must be submitted to the council, which may amend the proposition, and shall report thereon to the academy. Its report shall be considered by the academy in committee of the whole for amendment.

The proposition as amended, if adopted in committee of the whole, shall be voted on at the next stated meeting, and if it receives two-thirds of the votes cast it shall be declared adopted.

Absent members may send their votes on pending changes in the constitution to the home secretary in writing, and such votes shall be counted as if the members were present.

APPENDIX B.

RULES.

[In accordance with a resolution of the academy, taken at its meeting on April 21, 1915, the rules are arranged in groups and each group is numbered to correspond with the article of the constitution to which it relates.]

I.

1. The holders of the medal for eminence in the application of science to the public welfare shall be notified, like members, of the meetings of the academy, and invited to participate in its scientific sessions.

II.

1. The proper secretary shall acknowledge all donations made to the academy, and shall at once report them to the council for its consideration.

2. The home secretary shall be the custodian of all books, apparatus, archives, and collections not explicitly assigned to other care.

3. The home secretary shall keep a record of all grants of money or awards of prizes or medals made from trust funds of the academy. The assistant secretary, who may be a nonmember of the academy, shall receive a salary to be fixed by the council. The record for each grant of money shall include the following items: Name of fund, date and number of the grant, name and address of recipient, amount of grant and date or dates of payment, purpose of grant, record of report of progress, and resulting publications.

4. The treasurer shall keep the home secretary informed of all warrants received from directors of trust funds not controlled by the academy and of the date or dates of payment of all warrants.

5. The treasurer is authorized to defray, when approved by the president, all the proper expenses of committees appointed to make scientific investigations at the request of departments of the Government, and in each case to look to the department requesting the investigation for reimbursement to the academy.

6. The treasurer is authorized to act as the treasurer ex officio of the National Research Council.

7. The treasurer shall have the assistance of a salaried and bonded officer, the bursar, who shall be chosen by the finance committee and be directly responsible to the treasurer.

III.

1. The annual meeting of the academy shall begin on the fourth Monday of April. At the business sessions of the academy the order of procedure shall be as follows:

(1) Chair taken by the president, or, in his absence, by the vice president.
(2) Roll of members called by home secretary (first session of the meeting only).
(3) Minutes of the preceding session read and approved.
(4) Stated business.
(5) Reports of president, secretaries, treasurer, and committees.
(6) Business from council.
(7) Other business.

2. The rules of order of the academy shall be those of the Senate of the United States, unless otherwise provided by the constitution or rules of the academy.

3. In the absence of any officer a member shall be chosen to perform his duties temporarily, by a plurality of viva voce votes, upon open nomination.

4. At each meeting the president shall announce the death of any members since the preceding meeting. As soon as practicable thereafter he shall designate a member to write—or to secure from some other source approved by the president—a biographical notice of each deceased member.

5. A local committee of five members, appointed for each meeting, and the home secretary shall together constitute the committee of arrangements, of which the home secretary shall be chairman.

It shall be the duty of the committee of arrangements to prepare the scientific program for the annual meeting, and for this purpose it shall be empowered to solicit papers from members or others. It shall also be empowered to ascertain the length of time required for reading papers to be presented at the scientific sessions of the academy, and, when it appears advisable, to limit the time to be occupied in their presentation or discussion.

The committee of arrangements shall meet not less than two months previous to each meeting. It shall prepare the detailed program of each day, and in general shall have charge of all business and scientific arrangements for the meeting for which it is appointed.

6. No paper requiring more than 15 minutes for its presentation shall be accepted unless by invitation of the committee of arrangements.

No speaker shall occupy more than 30 minutes for presentation of papers during the scientific sessions of a single meeting of the academy, except by invitation of the committee of arrangements.

Time shall not be extended except by vote of the academy and then not to exceed five minutes. The presiding officer shall warn speakers two minutes before the expiration of their time.

The discussion of individual papers shall be limited not to exceed five minutes and the total time for discussion by any one speaker for all scientific sessions in any one meeting shall not exceed 15 minutes, unless approved by the academy.

No paper shall be entered upon the printed program of scientific sessions unless the title is in the hands of the committee of arrangements at least two weeks in advance of the meeting. In the event that titles are received later, they shall be placed in order of receipt at the end of the list and read, if there is time. Such supplementary titles shall be conspicuously posted.

IV.

1. The term of service of each chairman of a section shall be three years, to date from the closing session of the April meeting next following his election. Chairmen of sections shall be chosen by mail ballot, the member receiving the highest number of votes cast to be deemed elected. It shall be the duty of each retiring chairman to conduct the election of his successor and to report the result of the election to the home secretary before the April meeting at which his term of service expires. Should any section fail to elect a chairman before November 1, the president is empowered to appoint a temporary chairman to serve until the April meeting next following. No chairman shall be eligible for reelection for two consecutive terms.

2. The chairman of each section of the academy shall submit to the members of his section, not later than November 1 of each year, a ballot containing the names of all those persons who received not less than two votes in the nominating ballot of the preceding year and of any other persons who were newly proposed for consideration at that time. Each member of the section shall be expected to return this ballot to the chairman within two weeks with his signature and with crosses placed against the names of those persons whom he is prepared to indorse for nomination. Each member may also write upon the ballot in a place provided for the purpose any new names which he desires to have included in the ballot to be submitted to the section in the following year. The vote resulting from this ballot shall be regarded as informal.

The chairman shall then submit to the members of his section a new ballot showing the results of the informal vote; and each member shall be expected to return this ballot to the chairman with his signature and with crosses placed against the names of those persons whom he will indorse for nomination. In order to secure an adequate number of nominations, the chairman, when necessary, shall obtain by personal solicitation a fuller vote of his section or shall submit to the section a supplementary formal ballot.

The chairman shall then certify to the home secretary, prior to January 1, the names of those persons who have been voted for on the formal ballots by a majority of the members of the section, and shall furnish him a list of the publications of these nominees, as required by the constitution.

3. Nominations for membership shall give the full name, residence, and the official positions successively held by the candidate, in addition to the list of his contributions to science required by the constitution.

4. Preference ballots for election of members shall be sealed in a blank envelope, which shall be inclosed in another bearing the name of the sender, and which shall be addressed to the home secretary. Such envelopes shall be opened only by the tellers. If in any case the tellers are unable to determine who cast a ballot, or if the latter contains more names than are to be voted for, the ballot shall be rejected, but minor defects in a ballot shall be disregarded when the intent of the voter is obvious.

5. All discussions of the claims and qualifications of nominees at meetings of the academy shall be held strictly confidential, and remarks and criticisms then made may be communicated to no person who was not a member of the academy at the time of the discussion.

V.

1. The publication of the Proceedings shall be under the general charge of the council, which shall have final jurisdiction upon all questions of policy relating thereto.

The National Academy of Sciences and the National Research Council shall cooperate in the publication of the Proceedings, beginning with Volume VII.

2. Memoirs may be presented at any time to the home secretary, who shall report the date of their reception at the next session; but no memoir shall be published unless it has been read or presented by title before the academy.

Before publication all biographical and scientific memoirs must be referred to the committee on publication, who may, if they deem best, refer any memoir to a special committee, appointed by the president, to determine whether the same should be published by the academy.

3. Memoirs shall date, in the records of the academy, from the date of their presentation to the academy, and the order of their presentation shall be so arranged by the secretary that, so far as may be convenient, those upon kindred topics shall follow one another.

4. The annual report of the treasurer shall contain:

(1) A concise statement of the source, object, and amount of all trust funds of the academy.

(2) A condensed statement of receipts and expenditures.

(3) A statement of assets and liabilities.
(4) Accounts with individual funds.
(5) Such other matter as he considers appropriate.

5. The accounts of the treasurer shall, between July 1 and August 1 of each year, be audited under the direction of a committee of three members to be appointed by the president at the annual meeting of the academy. It shall be the duty of the auditing committee to verify the record of receipts and disbursements maintained by the treasurer and the agreement of book and bank balances; to examine all securities in the custody of the treasurer and to compare the stated income of such securities with the receipts of record; to examine all vouchers covering disbursements for account of the academy, including the National Research Council, and the authority therefor, and to compare them with the treasurer's record of expenditures; to examine and verify the account of the academy with each trust fund. The auditing committee may employ an expert accountant to assist the committee in the examination of the books of the treasurer. The annual report of the treasurer shall be published with that of the president to Congress. The reports of the treasurer and auditing committee shall be presented to the academy at the autumn meeting, and shall be published with that of the president to Congress. They shall be distributed to the members in printed form at the annual meeting.

VI.

1. All apparatus and other materials of permanent value purchased with money from any grant from a trust fund shall be the property of the academy unless specific exception is made in the grant or by subsequent action of the council or the directors of the trust fund concerned. Receipts for all such property shall be signed by the grantee and shall be forwarded to the home secretary. All apparatus and unused material of value acquired in this way shall be delivered to the home secretary on completion of the investigation for which the grant was made, or at any time on demand of the council, and the home secretary shall give an appropriate release therefor.

2. The books, apparatus, archives, and other collections of the academy shall be deposited in some safe place in the city of Washington. A list of the articles so deposited shall be kept by the home secretary, who is authorized to employ a clerk to take charge of them.

3. A stamp corresponding to the corporate seal of the academy shall be kept by the secretaries, who shall be responsible for the due markings of all books and other objects to which it is applicable.

Labels or other proper marks of similar device shall be placed upon objects not admitting of the stamp.

4. The fiscal year of the academy shall end on June 30 of each year.

5. The standing committee on finance shall consist of the president of the academy ex officio, the treasurer ex officio as chairman, and five members to be appointed annually by the president, two of whom may be nonmembers of the academy.

That a budget committee on the expenses of the National Academy and the National Research Council, to consist of the president of the academy, the chairman of the National Research Council, and the treasurer of the National Academy of Sciences and the National Research Council, be appointed and the president of the academy act as chairman.

VII.

1. Standing committees of the academy on trust funds the income of which is applied to the promotion of research shall consist of three or five members. In order to secure rotation in office in such committees, when not in conflict with the provisions of the deeds of gift, the term of service on a committee of three members shall be three years; on a committee of five members the term shall be five years.

2. The annual reports of the committees on research funds shall, so far as the academy has authority to determine their form, give a current number to each award, stating the name, position, and address of the recipient; the subject of research for which the award is made, and the sum awarded; and in later annual reports the status of the work accomplished under each award previously made shall be announced, until the research is completed, when announcement of its completion and, if published, the title and place of publication shall be stated, and the record of the award shall be reported as closed.

VIII.

1. Any rule of the academy may be amended, suspended, or repealed on the written motion of any two members, signed by them, and presented at a stated meeting of the academy, provided the same shall be approved by a majority of the members present.

APPENDIX C.

ORGANIZATION OF THE ACADEMY, 1922.

	Expiration of term.
Walcott, Charles D., president	April, 1923
Michelson, A. A., vice president	April, 1923
Millikan, R. A., foreign secretary	April, 1926
Abbot, C. G., home secretary	April, 1923
Ransome, F. L., treasurer	April, 1923

ADDITIONAL MEMBERS OF COUNCIL.

1920–1923.

Day, A. L. Morgan, T. H.

1921–1924.

Pearl, Raymond Hale, George E.

1922–1925.

Ames, J. S. Dunn, Gano

SECTIONS.

1. MATHEMATICS.

Birkhoff, G. D.
Blichfeldt, H. F.
Bliss, G. A.
Bolza, Oskar
Dickson, L. E.
Eisenhart, L. P.
Kasner, Edward
Miller, George A.
Moore, E. H.
Osgood, W. F.
Story, W. E.
Van Vleck, E. B.
Veblen, Oswald (chairman, 1925).
White, H. S.
Wilczynski, E. J.

2. ASTRONOMY.

Abbot, C. G. (chairman, 1923).
Adams, W. S.
Aitken, R. G.
Barnard, E. E.
Campbell, W. W.
Comstock, G. C.
Curtis, H. D.
Elkin, W. L.
Frost, E. B.
Hale, G. E.
Leuschner, A. O.
Moulton, F. R.
Russell, H. N.
Schlesinger, Frank
Seares, F. H.
Slipher, V. M.
Stebbins, Joel
Wright, W. H.

3. PHYSICS.

Ames, J. S.
Barus, Carl
Bridgman, P. W.
Burgess, G. K.
Crew, Henry
Duane, William
Hall, E. H.
Hastings, C. S.
Hayford, J. F.
Lyman, Theodore
Mendenhall, C. E.
Mendenhall, T. C.
Merritt, Ernest
Michelson, A. A.
Miller, D. C.
Millikan, R. A.
Nichols, E. F.
Nichols, E. L.
Pierce, G. W.
Pupin, M. I.
Stratton, S. W.
Thomson, Elihu
Trowbridge, Augustus (chairman, 1923).
Trowbridge, John
Webster, A. G.
Wilson, Edwin B.
Wood, R. W.
Woodward, R. S.

4. ENGINEERING.

Abbot, H. L.
Carty, J. J. (chairman, 1923).
Dunn, Gano
Durand, W. F.
Emmet, W. LeRoy
Freeman, J. R.
Hoover, Herbert
Jewett, F. B.
Kennelly, A. E.
Ryan, H. J.
Squier, G. O.
Stillwell, L. B.
Swasey, Ambrose
Taylor, D. W.

5. CHEMISTRY.

Bancroft, W. D.
Baxter, G. P.
Bogert, M. T.
Boltwood, B. B.
Chandler, C. F.
Clarke, F. W.
Franklin, E. C.
Gomberg, Moses
Gooch, F. A.
Harkins, W. D.
Hillebrand, W. F.
Hulett, G. A.
Jackson, C. L.
Johnson, T. B.
Kohler, E. P.
Langmuir, Irving
Lewis, G. N.
Michael, Arthur
Morley, E. W.
Noyes, A. A.
Noyes, W. A. (chairman, 1923).
Osborne, T. B.
Remsen, Ira
Richards, T. W.
Smith, Edgar F.
Stieglitz, Julius
Wells, H. L.
Whitney, W. R.

6. GEOLOGY AND PALEONTOLOGY.

Berry, E. W.
Chamberlin, T. C.
Clarke, J. M.
Cross, Whitman
Dall, W. H.
Dana, E. S.
Davis, W. M.
Day, A. L. (chairman, 1924).
Kemp, J. F.
Leith, C. K.
Lindgren, Waldemar
Merriam, J. C.
Merrill, G. P.
Osborn, H. F.
Pumpelly, Raphael
Ransome, F. L.
Reid, H. F.
Schuchert, Charles
Scott, W. B.
Ulrich, E. O.
Vaughan, T. W.
Walcott, C. D.
Washington, H. S.
White, David
Willis, Bailey

7. BOTANY.

Bailey, L. H. (chairman, 1924).
Britton, N. L.
Campbell, D. H.
Coulter, J. M.
Goodale, G. L.
Harper, R. A.
Jones, L. R.
Osterhout, W. J. V.
Robinson, B. L.
Sargent, C. S.
Setchell, W. A.
Smith, Erwin F.
Thaxter, Roland
Trelease, William

8. ZOOLOGY AND ANIMAL MORPHOLOGY.

Calkins, G. N.
Castle, W. E.
Chapman, F. M.
Conklin, E. G.
Davenport, C. B.
Donaldson, H. H.
Forbes, S. A.
Harrison, R. G. (chairman, 1925).
Herrick, C. J.
Howard, L. O.
Jennings, H. S.
Kofoid, C. L.
Lillie, F. R.
McClung, C. E.
Mark, E. L.
Morgan, T. H.
Morse, E. S.
Parker, G. H.
Pearl, Raymond
Ridgway, Robert
Stockard, C. R.
Verrill, A. E.
Wheeler, W. M.
Wilson, Edmund B.

9. PHYSIOLOGY AND PATHOLOGY.

Abel, J. J.
Benedict, F. G.
Cannon, W. B.
Carlson, A. J.
Chittenden, R. H.
Cole, Rufus
Councilman, W. T.
Cushing, Harvey
Erlanger, J.
Flexner, Simon
Folin, Otto
Halsted, W. S.

Hektoen, Ludvig
Henderson, L. J.
Howell, W. H.
Hunt, Reid
Jones, Walter
Levene, P. A. T.
Loeb, Jacques
Lusk, Graham (chairman. 1925).
MacCallum, W. G.
McCollum, E. V.
Mendel, L. B.
Prudden, T. M.
Smith, Theobald
Van Slyke, D. D.
Vaughan, V. C.
Welch, W H.

10. ANTHROPOLOGY AND PSYCHOLOGY.

Angell, J. R.
Boas, Franz
Cattell, J. McK.
Dewey, John
Fewkes, J. W. (acting chairman).
Hall, G. S.
Holmes, W. H.
Hrdlicka, Ales
Merriam, C. H.
Seashore, C. E.
Thorndike, E. L.
Woodworth, R. S.

STANDING COMMITTEES.

ON WEIGHTS, MEASURES, AND COINAGE.

Stratton, S. W. (chairman).
Mendenhall, T. C.
Michelson, A. A.
Webster, A. G.
Woodward, R. S.

ON SOLAR RESEARCH.

Hale, G. E. (chairman).
Campbell, W. W.
Michelson, A. A.
Nichols, E. L.

ON PUBLICATION.

The President.
The Home Secretary.
Stratton, S. W.

EDITORIAL BOARD OF THE PROCEEDINGS.

The home secretary and the foreign secretary of the academy, the chairman of the executive board, and the permanent secretary of the National Research Council.

William Duane, 1923.
R. G. Harrison, 1923.
E. H. Moore, 1923.
F. Schlesinger, 1923.
W. M. Wheeler, 1923.
Arthur L. Day, 1922.
Gano Dunn, 1922.
L. J. Henderson, 1922.
W. J. V. Osterhout, 1922.
J. M. Clarke.
Raymond Dodge.
N. M. Fenneman.
A. D. Flinn.
F. P. Gay.
F. R. Lillie.
E. W. Washburn.

ON COLLECTION OF HISTORICAL PORTRAITS, MANUSCRIPTS, INSTRUMENTS, ETC.

Walcott, C. D. (chairman).
Clarke, F. W.
Hale, G. E.
Pupin, M. I.

FINANCE COMMITTEE.

Ransome, F. L. (chairman).
Cross, Whitman
Dunn, Gano.
Walcott, C. D.

TRUST FUNDS.

THE BACHE FUND.

[$60,000.]

Researches in physical and natural science.

Harrison, R. G. (chairman).
Curtis, H. D.
Webster, A. G.

THE WATSON FUND.

[$25,000.]

Watson medal and the promotion of astronomical research.

Leuschner, A. O. (chairman).	Comstock, G. C.	Elkins, W. L.

WATSON MEDAL AWARDS.

B. A. Gould, 1887.	Arthur Auwers, 1891.	J. C. Kapteyn, 1913.
Ed. Schoenfeld, 1889.	S. C. Chandler, 1894.	A. O. Leuschner, 1915.
	Sir David Gill, 1899.	

THE HENRY DRAPER FUND.

[$10,000.]

Draper medal and investigations in astronomical physics.

Campbell, W. W. (chairman), 1924.	Abbot, C. G., 1926.	Michelson, A. A., 1927.
	Hale, G. E., 1923.	Russell, H. N., 1925.

HENRY DRAPER MEDAL AWARDS.

S. P. Langley, 1886.	George E. Hale, 1904.	W. S. Adams, 1918.
E. C. Pickering, 1888.	W. W. Campbell, 1907.	Charles Fabry, 1919.
H. A. Rowland, 1890.	C. G. Abbot, 1910.	Alfred Fowler, 1920.
H. K. Vogel, 1893.	H. Deslandres, 1913.	Pieter Zeeman, 1921.
J. E. Keeler, 1899.	Joel Stebbins, 1915.	H. N. Russell, 1922.
Sir Wm. Huggins, 1901.	A. A. Michelson, 1916.	

THE J. LAWRENCE SMITH FUND.

[$10,000.]

J. Lawrence Smith medal and investigations of meteoric bodies.

Cross, Whitman (chairman), 1927.	Adams, W. S., 1924.	Dana, E. S., 1923.
Schlesinger, F., 1925.	Clarke, F. W., 1926.	

J. LAWRENCE SMITH MEDAL AWARDS.

H. A. Newton, 1888.	George P. Merrill, 1922.

THE BARNARD MEDAL.[1]

Meritorious service to science.

Noyes, A. A. (chairman).	Campbell, W. W.	Nichols, E. F.
Morgan, T. H.	Richards, T. W.	

BARNARD MEDAL AWARDS.

Sir Ernest Rutherford, 1909.	Sir W. H. Bragg, 1914.	Albert Einstein, 1921.

[1] Every five years the committee recommends the person whom they consider most deserving of the medal, and upon the approval of the academy the name of the nominee is forwarded to the trustees of Columbia University, who administer the Barnard medal fund.

THE BENJAMIN APTHORP GOULD FUND.

[$20,000.]

Researches in astronomy.

Moulton, F. R. (chairman). Barnard, E. E. Woodward, R. S.

THE WOLCOTT GIBBS FUND.

[$5,545.50.]

Chemical research.

Richards, T. W. Smith, Edgar F.

THE COMSTOCK FUND.

[$12,406.02.]

Researches in electricity, magnetism, and radiant energy.

Nichols, E. L. (chairman), 1923. Millikan, R. A., 1926. Whitney, W. R., 1924.
Carty, J. J., 1925. Crew, Henry, 1927.

COMSTOCK PRIZE AWARDS.

R. A. Millikan, 1913. S. J. Barnett, 1918.

THE MARSH FUND.

[$20, 000.]

Original research in the natural sciences.

Merriam, J. C. (chairman), 1925. Clarke, J. M., 1923.

Schuchert, Charles, 1924.

THE AGASSIZ FUND.

[$50, 000.]

General uses of the academy.

AGASSIZ MEDAL AWARDS.

Johan Hjort, 1913. Albert I, Prince of Monaco, 1918. C. D. Sigsbee, 1920.

THE MURRAY FUND.

[$6, 000.]

Agassiz medal and contributions to oceanography.

Dall, W. H. (chairman), 1924. Davis, W. M., 1925. Mayor, A. G., 1923.

THE MARCELLUS HARTLEY FUND.

[$1, 200.]

Medal for eminence in the application of science to the public welfare.

Stratton, S. W. (chairman), 1925. Pupin, M. I., 1924. Osborn, H. F., 1924.
Angell, J. R., 1925. Welch, W. H., 1923. Taylor, D. W., 1923.

PUBLIC WELFARE MEDAL AWARDS.

(In memory of Marcellus Hartley.)

G. W. Goethals, 1914.
W. C. Gorgas, 1914.
Cleveland Abbe, 1916.
Gifford Pinchot, 1916.
S. W. Stratton, 1917.
Herbert Hoover, 1920.
C. W. Stiles, 1921.

THE DANIEL GIRAUD ELLIOT FUND.

[$8,000.]

Medal and honorarium for most meritorious work in zoology or paleontology published in each year.

Osborn, H. F. (chairman).
[1] Lucas, F. A.
Walcott, C. D.

DANIEL GIRAUD ELLIOT MEDAL AWARDS.

F. M. Chapman, 1918.
William Beebe, 1919.
Robert Ridgway, 1920.
Othenio Abel, 1921.

THE MARY CLARK THOMPSON FUND.

[$10,000.]

Medal for most important services to geology and paleontology.

Clarke, J. M. (chairman), 1925.
Lindgren, W., 1923.
Osborn, H. F., 1924.

MARY CLARK THOMPSON MEDAL AWARDS.

C. D. Walcott, 1921.

THE JOSEPH HENRY FUND.

[$40,000.]

To assist meritorious investigators, especially in the direction of original research.

Durand, W. F. (chairman).
Davenport, C. B.
Merriam, J. C.
Day, Arthur L.
McClung, C. E.

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[1] Not a member of the academy.

MEMBERS OF THE NATIONAL ACADEMY OF SCIENCES.

June 30, 1922.

	Date of election.
Abbot, C. G., Smithsonian Institution, Washington, D. C.	1915
Abbot, H. L., 23 Berkeley Street, Cambridge 38, Mass.	1872
Abel, J. J., Johns Hopkins University, Baltimore, Md.	1912
Adams, W. S., Solar Observatory Office, Pasadena, Calif.	1917
Aitken, R. G., Lick Observatory, Mount Hamilton, Calif.	1918
Ames, J. S., Johns Hopkins University, Baltimore, Md.	1909
Angell, J. R., Yale University, New Haven, Conn.	1920
Bailey, L. H., Ithaca, N. Y.	1917
Bancroft, W. D., 7 East Avenue, Ithaca, N. Y.	1920
Barnard, E. E., Yerkes Observatory, Williams Bay, Wis.	1911
Barus, Carl, Brown University, Providence, R. I.	1892
Baxter, G. P., T. J. Coolidge, jr., Memorial Laboratory, Cambridge, Mass.	1916
Bell, A. Graham, 1331 Connecticut Avenue, Washington, D. C.	1883
Benedict, F. G., Nutrition Laboratory, Boston 17, Mass.	1914
Berry, E. W., Johns Hopkins University, Baltimore, Md.	1922
Birkhoff, G. D., Harvard University, Cambridge, Mass.	1918
Blichfeldt, H. F., Stanford University, Calif.	1920
Bliss, G. A., University of Chicago, Chicago, Ill.	1916
Boas, Franz, Columbia University, New York City	1900
Bogert, M. T., Columbia University, New York City	1916
Boltwood, B. B., Yale University, New Haven, Conn.	1911
Bolza, O., Reichsgrafenstr. 10, Freiburg, Germany	1909
Bridgman, P. W., Jefferson Physical Laboratory, Cambridge, Mass.	1918
Britton, N. L., New York Botanical Gardens, New York City	1914
Burgess, G. K., Bureau of Standards, Washington, D. C.	1922
Calkins, G. N., Columbia University, New York, N. Y.	1919
Campbell, D. H., Stanford University, Calif.	1910
Campbell, W. W., Lick Observatory, Mount Hamilton, Calif.	1902
Cannon, W. B., Harvard University, Cambridge, Mass.	1914
Carlson, A. J., University of Chicago, Chicago, Ill.	1920
Carty, J. J., American Telegraph & Telephone Co., New York City	1917
Castle, W. E., 186 Payson Road, Belmont, Mass.	1915
Cattell, James McK., Garrison, N. Y.	1901
Chamberlin, T. C., University of Chicago, Chicago, Ill.	1903
Chandler, C. F., Columbia University, New York City	1874
Chapman, F. M., American Museum, Natural History, New York City	1921
Chittenden, R. H., Sheffield Scientific School, New Haven, Conn.	1890
Clarke, F. W., United States Geological Survey, Washington, D. C.	1909
Clarke, J. M., State Museum, Albany, N. Y.	1909
Cole, Rufus, Rockefeller Hospital, New York City	1922
Comstock, G. C., Washburn Observatory, Madison, Wis.	1899
Conklin, E. G., Princeton, N. J.	1908
Coulter, J. M., University of Chicago, Chicago, Ill.	1909
Councilman, W. T., Harvard Medical School, Boston, Mass.	1904
Crew, Henry, Northwestern University, Evanston, Ill.	1909

	Date of election.
Cross, Whitman, 101 East Kirke Street, Chevy Chase, Md	1908
Curtis, H. D., Allegheny Observatory, Pittsburgh, Pa	1919
Cushing, Harvey, Harvard University, Cambridge, Mass	1917
Dall, W. H., Smithsonian Institution, Washington, D. C	1897
Dana, E. S., Yale University, New Haven, Conn	1884
Davenport, C. B., Cold Spring Harbor, N. Y	1912
Davis, W. M., 31 Hawthorn Street, Cambridge 38, Mass	1904
Day, A. L., 2801 Upton Street, Washington, D. C	1911
Dewey, John, Columbia University, New York City	1910
Dickson, L. E., University of Chicago, Chicago, Ill	1913
Donaldson, H. H., Wistar Institute of Anatomy, Philadelphia, Pa	1914
Duane, W., Harvard University, Cambridge, Mass	1920
Dunn, Gano, 43 Exchange Place, New York City	1919
Durand, W. F., Leland Stanford University, Calif	1917
Eisenhart, L. P., Princeton University, Princeton, N. J	1922
Elkin, W. L., 206 Livingston Street, New Haven, Conn	1917
Emmet, W. Le Roy, General Electric Co., Schenectady, N. Y	1921
Erlanger, Joseph, Washington University, St. Louis, Mo	1922
Fewkes, J. W., Bureau of American Ethnology, Washington, D. C	1914
Flexner, Simon, Rockefeller Institute, New York City	1908
Folin, Otto, Harvard Medical School, Boston, Mass	1916
Forbes, Stephen Alfred, Urbana, Ill	1918
Franklin, E. C., Leland Stanford University, Calif	1914
Freeman, John Ripley, Providence, R. I	1918
Frost, E. B., Yerkes Observatory, Williams Bay, Wis	1908
Gomberg, Moses, University of Michigan, Ann Arbor, Mich	1914
Gooch, Frank A., 291 Edwards Street, New Haven, Conn	1897
Goodale, George L., Harvard University, Cambridge, Mass	1890
Hale, George E., Solar Observatory Office, Pasadena, Calif	1902
Hall, Edwin H., Harvard University, Cambridge, Mass	1911
Hall, G. S., Clark University, Worcester, Mass	1915
Halsted, W. S., Johns Hopkins Medical School, Baltimore, Md	1917
Harkins, W. D., University of Chicago, Chicago, Ill	1921
Harper, R. A., Columbia University, New York City	1911
Harrison, Ross G., Yale University, New Haven, Conn	1918
Hastings, C. S., Yale University, New Haven, Conn	1889
Hayford, J. F., Northwestern University, Evanston, Ill	1911
Hektoen, Ludvig, 637 South Wood Street, Chicago, Ill	1918
Henderson, L. J., Harvard University, Cambridge, Mass	1919
Herrick, C. J., University of Chicago, Chicago, Ill	1918
Hillebrand, W. F., Bureau of Standards, Washington, D. C	1908
Holmes, W. H., United States National Museum, Washington, D. C	1905
Hoover, H. C., Secretary of Commerce, Washington, D. C	1922
Howard, L. O., United States Department of Agriculture, Washington, D. C	1916
Howell, W. H., School of Hygiene and Public Health, Baltimore, Md	1905
Hrdlička, Aleš, United States National Museum, Washington, D. C	1921
Hulett, G. A., Princeton University, Princeton, N. J	1922
Hunt, Reid, Harvard Medical School, Boston, Mass	1919
Jackson, Charles L., 383 Beacon Street, Boston, Mass	1883
Jennings, H. S., Johns Hopkins University, Baltimore, Md	1914
Jewett, F. B., Western Electric Co., New York, N. Y	1918
Johnson, T. B., Yale University, New Haven, Conn	1919

	Date of election.
Jones, L. R., University of Wisconsin, Madison, Wis	1920
Jones, Walter, Johns Hopkins University, Baltimore, Md	1918
Kasner, Edward, Columbia University, New York City	1917
Kemp, James F., Columbia University, New York City	1911
Kennelly, A. E., Harvard University, Cambridge, Mass	1921
Kofoid, C. A., University of California, Berkeley, Calif	1922
Kohler, E. P., Harvard University, Cambridge, Mass	1920
Langmuir, Irving, General Electric Co., Schenectady, N. Y	1918
Leith, C. K., University of Wisconsin, Madison, Wis	1920
Leuschner, A. O., University of California, Berkeley, Calif	1913
Levene, P. A. T., Rockefeller Institute, New York City	1916
Lewis, G. N., University of California, Berkeley, Calif	1913
Lillie, F. R., University of Chicago, Chicago, Ill	1915
Lindgren, Waldemar, Massachusetts Institute of Technology, Cambridge, Mass.	1909
Loeb, Jacques, Rockefeller Institute, New York City	1910
Lusk, Graham, Cornell University Medical College, New York City	1915
Lyman, Theodore, Harvard University, Cambridge, Mass	1917
MacCallum, W. G., Johns Hopkins Hospital, Baltimore, Md	1921
McClung, Clarence E., University of Pennsylvania, Philadelphia, Pa	1920
McCollum, E. V., Johns Hopkins Medical School, Baltimore, Md	1920
Mark, Edward L., 109 Irving Street, Cambridge, Mass	1903
Mendel, L. B., Yale University, New Haven, Conn	1913
Mendenhall, C. E., University of Wisconsin, Madison, Wis	1918
Mendenhall, T. C., 329 North Chestnut Street, Ravenna, Ohio	1887
Merriam, C. Hart, 1919 Sixteenth Street, Washington, D. C	1902
Merriam, J. C., Carnegie Institution, Washington, D. C	1918
Merrill, G. P., United States National Museum, Washington, D. C	1922
Merritt, Ernest, Cornell University, Ithaca, N. Y	1914
Michael, Arthur, 219 Parker Street, Newton Center, Mass	1889
Michelson, A. A., University of Chicago, Chicago, Ill	1888
Miller, D. C., Case School of Applied Science, Cleveland, Ohio	1921
Miller, G. A., University of Illinois, Urbana, Ill	1921
Millikan, R. A., California Institute of Technology, Pasadena, Calif	1915
Moore, E. H., University of Chicago, Chicago, Ill	1901
Morgan, T. H., Columbia University, New York City	1909
Morley, Edward W., West Hartford, Conn	1897
Morse, Edward S., Salem, Mass	1876
Moulton, F. R., University of Chicago, Chicago, Ill	1910
Nichols, E. L., Cornell University, Ithaca, N. Y	1901
Nichols, E. F., Nela Research Laboratory, Cleveland, Ohio	1908
Noyes, A. A., California Institute of Technology, Pasadena, Calif	1905
Noyes, W. A., University of Illinois, Urbana, Ill	1910
Osborn, H. F., American Museum of Natural History, New York City	1900
Osborne, T. B., Agricultural Experiment Station, New Haven, Conn	1910
Osgood, W. F., Harvard University, Cambridge, Mass	1904
Osterhout, W. J. V., Harvard University, Cambridge, Mass	1919
Parker, G. H., 16 Berkeley Street, Cambridge, Mass	1913
Pearl, Raymond, 625 St. Paul Street, Baltimore, Md	1916
Pierce, G. W., Harvard University, Cambridge, Mass	1920
Prudden, T. M., 160 West Fifty-ninth Street, New York City	1901
Pumpelly, Raphael, Gibbs Avenue, Newport, R. I	1872
Pupin, M. I., Columbia University, New York City	1905

	Date of election.
Ransome, F. L., United States Geological Survey, Washington, D. C	1914
Reid, H. F., Johns Hopkins University, Baltimore, Md	1912
Remsen, Ira, Johns Hopkins University, Baltimore, Md	1882
Richards, T. W., Wolcott Gibbs Memorial Laboratory, Cambridge, Mass	1899
Ridgway, Robert, 1030 South Morgan Street, Olney, Ill	1917
Robinson, B. L., Harvard University, Cambridge, Mass	1921
Russell, H. N., Princeton University, Princeton, N. J	1918
Ryan, H. J., Stanford University, Stanford, Calif	1920
Sargent, C. S., Arnold Arboretum, Jamaica Plains, Mass	1895
Schlesinger, Frank, Yale University Observatory, New Haven, Conn	1916
Schuchert, Charles, Yale University, New Haven, Conn	1910
Scott, W. B., Princeton University, Princeton, N. J	1906
Seares, F. H., Mount Wilson Observatory, Pasadena, Calif	1919
Seashore, C. E., State University of Iowa, Iowa City, Iowa	1922
Setchell, W. A., University of California, Berkeley, Calif	1919
Slipher, V. M., Lowell Observatory, Flagstaff, Ariz	1921
Smith, Alexander, Columbia University, New York City	1915
Smith, Edgar F., University of Pennsylvania, Philadelphia, Pa	1899
Smith, Erwin F., Bureau of Plant Industry, Washington, D. C	1913
Smith, Theobald, Rockefeller Institute for Medical Research, Princeton, N. J	1908
Squier, G. O., Chief Signal Officer, United States Army, Washington, D. C	1919
Stebbins, Joel, Washburn Observatory, Madison, Wis	1920
Stieglitz, Julius, University of Chicago, Chicago, Ill	1911
Stillwell, L. B., 143 Liberty Street, New York City	1921
Stockard, C. R., Cornell University Medical School, New York City	1922
Story, William E., Clark University, Worcester, Mass	1908
Stratton, S. W., Bureau of Standards, Washington, D. C	1917
Swasey, Ambrose, 5701 Carnegie Avenue, Cleveland, Ohio	1922
Taylor, D. W., Department of the Navy, Washington, D. C	1918
Thaxter, Roland, Harvard University, Cambridge, Mass	1912
Thomson, Elihu, Swampscott, Mass	1907
Thorndike, E. L., Columbia University, New York City	1917
Trelease, William, University of Illinois, Urbana, Ill	1902
Trowbridge, Augustus, Princeton University, Princeton, N. J	1919
Trowbridge, John, Harvard University, Cambridge, Mass	1878
Ulrich, E. O., United States Geological Survey, Washington, D. C	1917
Van Slyke, D. D., Rockefeller Institute, New York City	1921
Van Vleck, E. B., University of Wisconsin, Madison, Wis	1911
Vaughan, T. W., United States National Museum, Washington, D. C	1921
Vaughan, V. C., University of Michigan, Ann Arbor, Mich	1915
Veblen, Oswald, Princeton University, Princeton, N. J	1919
Verrill, A. E., Whitney Avenue and Central Avenue, New Haven, Conn	1872
Walcott, C. D., Smithsonian Institution, Washington, D. C	1896
Washington, H. S., Geophysical Laboratory, Washington, D. C	1921
Webster, Arthur G., Clark University, Worcester, Mass	1903
Welch, William H., 807 St. Paul Street, Baltimore, Md	1895
Wells, Horace L., Yale University, New Haven, Conn	1903
Wheeler, W. M., Harvard University, Cambridge, Mass	1912
White, David, United States Geological Survey, Washington, D. C	1912
White, H. S., Vassar College, Poughkeepsie, N. Y	1915
Whitney, W. R., General Electric Co., Schenectady, N. Y	1917
Wilczynski, E. J., University of Chicago, Chicago, Ill	1919

	Date of election.
Willis, Bailey, Leland Stanford University, Stanford, Calif	1920
Wilson, Edmund B., Columbia University, New York City	1899
Wilson, Edwin B., 240 Longwood Avenue, Boston 17, Mass	1919
Wood, R. W., Johns Hopkins University, Baltimore, Md	1912
Woodward, Robert S., Carnegie Institution, Washington, D. C	1896
Woodworth, R. S., Columbia University, New York City	1921
Wright, W. H., Lick Observatory, Mount Hamilton, Calif	1922

HONORARY MEMBER.

Smith, Sidney I., Yale University, New Haven, Conn	1884

FOREIGN ASSOCIATES.

Adams, F. D., McGill University, Montreal, Canada	1920
Arrhenius, S. A., Nobelinstitut, Stockholm	1908
Barrois, Charles, Universite, Lille	1908
Bateson, W., John Innes Horticultural Institute, Merton Park, Surrey	1921
Brøgger, W. C., Universitet, Christiania	1903
De Vries, Hugo, Lunteren, Holland	1904
Deslandres, Henri, Astrophysical Observatory, Meudon	1913
Dewar, Sir James, University, Cambridge, England	1907
Eijkman, Christian, University of Utrecht, Utrecht, Holland	1921
Einstein, Albert, University of Berlin, Berlin, Germany	1922
Forsyth, A. R., Imperial College of Science and Technology, London	1907
Geikie, Sir Archibald, Haslemere, Surrey	1901
Groth, Paul von, Universität, Munich	1905
Heim, Albert, Zurich	1913
Hilbert, David, Universität, Gottingen	1907
Klein, Felix, Universität, Gottingen	1898
Kossel, Albrecht, Heidelberg	1913
Küstner, Karl Friedrich, Bonn	1913
Lacroix, F. A. A., Musee d'Histoire Naturelle, Paris	1920
Lankester, Sir E. Ray, 44 Oakley Street, Chelsea, S. W. 3, London	1903
Larmor, Sir Joseph, St. Johns College, Cambridge	1908
Lorentz, Hendrik Anton, Rijks Universiteit, Leiden	1906
Onnes, Heike Kammerlingh, University of Leiden, Leiden	1920
Ostwald, Wilhelm, Grossbothen bei Leipzig	1906
Pavlov, I. P., Institute for Experimental Medicine, Petrograd	1908
Penck, Albrecht, Universität, Berlin	1909
Picard, Charles Emile, Universite, Paris	1903
Prain, Sir David, Royal Botanic Gardens, Kew, Surrey	1920
Ramon y Cajal, Santiago, University of Madrid, Madrid	1920
Rutherford, Sir Ernest, Newnham Cottage, Queen's Road, Cambridge	1911
Schuster, Sir Arthur, Yeldall, Twyford, Berkshire	1913
Seeliger, Hugo Ritter von, Universität, Munich	1908
Thomson, Sir Joseph, University, Cambridge	1903
Volterra, Vito, Universita, Rome	1911
Van der Waals, Johannes D., Amsterdam	1913
Wolf, Max F. J. C., Heidelberg	1913

Medalists.

	Medal.	Year awarded.
Abel, Othenio [1]	Elliot	1921
Abbot, Charles Greeley	Draper	1910
Adams, Walter Sidney	Draper	1918
Barnett, Samuel Jackson [1]	Comstock	1918
Beebe, William [1]	Elliot	1919
Bragg, Sir William Henry [1]	Barnard	1914
Campbell, William Wallace	Draper	1907
Chapman, Frank Michler	Elliot	1918
Deslandres, Henri	Draper	1913
Einstein, Albert	Barnard	1921
Fabry, Charles [1]	Draper	1919
Fowler, Alfred [1]	Draper	1920
Goethals, George Washington [1]	Welfare	1914
Hale, George Ellery	Draper	1904
Hjort, Johan [1]	Agassiz	1913
Hoover, Herbert	Welfare	1920
Kapteyn, John C	Watson	1913
Leuschner, Armin Otto	Watson	1915
Margerie, Emmanuel de [1]	Thompson	1923
Merrill, George Perkins	Smith	1922
Michelson, Albert Abraham	Draper	1916
Millikan, Robert Andrews	Comstock	1913
Pinchot, Gifford [1]	Welfare	1916
Ridgway, Robert	Elliot	1920
Russell, Henry Norris	Draper	1922
Rutherford, Sir Ernest	Barnard	1909
Sigsbee, Rear Admiral Charles Dwight, U. S. Navy [1]	Agassiz	1920
Stebbins, Joel	Draper	1915
Stiles, Charles Wardell [1]	Welfare	1921
Stratton, Samuel Wesley	Welfare	1917
Walcott, Charles Doolittle	Thompson	1921
Zeeman, Pieter [1]	Draper	1921

[1] Not member or foreign associate of the academy.

Deceased members.

	Date of election.	Date of death.		Date of election.	Date of death.
Abbe, Cleveland	1878	Oct. 28, 1916	Brown-Sequard, Chas. E.	1868	Apr. 2, 1894
Agassiz, Alexander	1866	Mar. 27, 1910	Brush, George Jarvis	1868 [2]	Feb. 6, 1912
Agassiz, Louis	(1)	Dec. 14, 1873	Bumstead, Henry A.	1913 [2]	Dec. 31, 1920
Atkinson, George Francis	1918 [2]	Nov. 14, 1918	Casey, Thomas L.	1890	Mar. 25, 1896
Alexander, J. H	(1)	Mar. 2, 1867	Caswell, Alexis	(1)	Jan. 8, 1877
Alexander, Stephen	(1)	June 25, 1883	Chandler, Seth Carlo	1888 [2]	Dec. 31, 1913
Allen, J. A	1876 [2]	Aug. 29, 1921	Chauvenet, William	(1)	Dec. 13, 1877
Armsby, H. P	1920 [2]	Oct. 19, 1921	Clark, Henry James	1872	July 1, 1879
Bache, Alexander Dallas	(1)	Feb. 14, 1867	Clark, William B	1908	July 27, 1913
Baird, Spencer F	1864	Aug. 19, 1887	Coffin, James H	1869	Feb. 6, 1873
Barker, George F	1876 [2]	May 24, 1910	Coffin, J. H. C	(1)	Jan. 8, 1890
Barnard, F. A. P	(1, 2)	Apr. 27, 1889	Comstock, Cyrus B	1884	May 29, 1910
Barnard, J. G	(1)	May 14, 1882	Cook, George H	1887	Sept. 22, 1889
Barrell, Joseph	1919 [2]	May 4, 1919	Cooke, Josiah P	1872	Sept. 3, 1894
Bartlett, W. H. C	(1)	Feb. 11, 1893	Cope, Edward D	1872 [2]	Apr. 12, 1897
Becker, George Ferdinand	1901 [2]	Apr. 20, 1919	Coues, Elliott	1877	Dec. 25, 1899
Beecher, Charles Emerson	1899	Feb. 14, 1904	Crafts, James M	1872	June 21, 1917
Billings, John S	1883	Mar. 11, 1913	Dalton, J. C	1864	Feb. 2, 1889
Bôcher, Maxime	1909 [2]	Sept. 12, 1918	Dana, James D	(1)	Apr. 14, 1895
Boss, Lewis	1889	Oct. 5, 1912	Davidson, George	1874 [2]	Dec. 2, 1911
Bowditch, Henry P	1887 [2]	Mar. 13, 1911	Davis, Charles H	(1)	Feb. 18, 1877
Branner, J. C	1905 [2]	Mar. 1, 1922	Draper, Henry	1877	Nov. 20, 1882
Brewer, William H	1880 [2]	Nov. 2, 1910	Draper, John W	1877	Jan. 4, 1882
Brooks, William Keith	1884	Nov. 12, 1908	Dutton, C. E	1884 [2]	Jan. 4, 1912

[1] Charter members, Mar. 3, 1863.

[2] Biographical memoirs have not been presented.

Deceased members—Continued.

	Date of election.	Date of death.
Eads, James B	1872	Mar. 8, 1887
Emmons, Samuel F	1892	Mar. 28, 1911
Engelmann, George	(1)	Feb. 4, 1884
Farlow, W. G	1879 [2]	June 3, 1919
Ferrel, William	1868	Sept. 18, 1891
Fraser, John Fries	(1)	Oct. 12, 1872
Gabb, William M	1876	May 30, 1878
Genth, F. A	1872	Feb. 2, 1893
Gibbs, Josiah Willard	1879	Apr. 28, 1903
Gibbs, Wolcott	(1)	Dec. 9, 1908
Gilbert, Grove Karl	1883 [2]	May 1, 1918
Gill, Theodore Nicholas	1873	Sept. 25, 1914
Gilliss, James Melville	(1)	Feb. 9, 1865
Goode, G. Brown	1888	Sept. 6, 1896
Gould, Augustus A	(1)	Sept. 15, 1866
Gould, Benjamin A	(1, 2)	Nov. 26, 1896
Gray, Asa	(1)	Jan. 30, 1888
Guyot, Arnold	(1)	Feb. 8, 1884
Hadley, James	1872	Nov. 14, 1872
Hague, Arnold	1885	May 15, 1917
Haldeman, S. S	1876	Sept. 20, 1880
Hall, Asaph	1875	Nov. 22, 1907
Hall, James	(1, 2)	Aug. 7, 1898
Hayden, F. V	1873	Dec. 22, 1887
Henry, Joseph	(1)	May 13, 1878
Hilgard, Eugene W	1872	Jan. 8, 1916
Hilgard, Julius E	(1)	May 9, 1890
Hill, George William	1874	Apr. 16, 1914
Hill, Henry B	1883	Apr. 6, 1903
Hitchcock, Edward	(1)	Feb. 27, 1864
Holbrook, J. E	1868	Sept. 8, 1871
Holden, Edward Singleton	1885	Mar. 16, 1914
Howe, H. M	1917 [2]	May 14, 1922
Hubbard, J. S	(1)	Aug. 16, 1863
Humphreys, A. A	(1)	Dec. 27, 1883
Hunt, T. Stery	1873 [2]	Feb. 12, 1892
Hyatt, Alpheus	1875	Jan. 15, 1902
Iddings, Joseph P	1807 [2]	Sept. 8, 1920
James, Williams [3]	1903	Aug. 26, 1910
Johnson, S. W	1866	July 21, 1909
Keeler, J. E	1900	Aug. 12, 1900
King, Clarence	1876	Dec. 24, 1901
Kirtland, Jared P	1865	Dec. 10, 1877
Lane, J. Homer	1872	May 3, 1880
Langley, Samuel P	1876	Feb. 27, 1906
Lea, Matthew Carey	1892	Mar. 15, 1897
Le Conte, John	1878	Apr. 29, 1891
Le Conte, John L	(1)	Nov. 15, 1883
Le Conte, Joseph	1875	July 6, 1901
Leidy, Joseph	(1)	Apr. 30, 1891
Lesley, J. Peter	(1)	June 1, 1903
Lesquereux, Leo	1864	Oct. 20, 1889
Longstreth, Miers F	(1)	Dec. 27, 1891
Loomis, Elias	1873	Aug. 15, 1889
Lovering, Joseph	1873	Jan. 18, 1892
Lyman, Theodore	1872	Sept. 9, 1897
Mahan, D. H	(1)	Sept. 16, 1871
Mall, Franklin P	1907 [2]	Nov. 17, 1917
Marsh, G. P	1866	July 23, 1882
Marsh, O. C	1874 [2]	Mar. 18, 1899
Mayer, Alfred M	1872	July 13, 1897
Mayor, A. G	1916 [2]	June 25, 1922
Meek, F. B	1869	Dec. 21, 1876
Meigs, M. C	1865	Jan. 2, 1892
Meltzer, Samuel James	1912 [2]	Nov. 8, 1920
Minot, Charles Sedgwick	1897	Nov. 19, 1914
Mitchell, Henry	1885 [2]	Dec. 1, 1902
Mitchell, Silas Weir	1865	Jan. 4, 1914
Morgan, Lewis H	1875	Dec. 17, 1881
Morse, Harmon N	1907 [2]	Sept. 8, 1920
Morton, Henry	1874	May 9, 1902
Nef, John Ulric	1904 [2]	Aug. 13, 1915
Newberry, J. S	(1)	Dec. 7, 1892
Newcomb, Simon	1869 [2]	July 11, 1909
Newton, H. A	(1)	Aug. 12, 1896
Newton, John	1876	May 1, 1895
Norton, William A	1873	Sept. 21, 1883
Oliver, James E	1872	Mar. 27, 1895
Packard, A. S	1872	Feb. 14, 1905
Penfield, Samuel L	1900	Aug. 13, 1906
Peters, C. H. F	1876 [2]	July 18, 1890
Peirce, Benjamin [3]	(1, 2)	Oct. 6, 1880
Peirce, Benjamin Osgood	1906	Jan. 14, 1914
Pickering, Edward C	1873 [2]	Feb. 3, 1919
Pierce, Charles S. S	1876 [2]	Apr. 20, 1914
Pirsson, Louis V	1913 [2]	Dec. 8, 1919
Pourtales, L. F	1873	July 19, 1880
Powell, John W	1880	Sept. 23, 1902
Putnam, Frederick W	1885 [2]	Aug. 18, 1915
Rodgers, John	(1)	May 5, 1882
Rogers, Fairman	(1)	Aug. 22, 1900
Rogers, Robert E. [4]	(1)	Sept. 6, 1884
Rogers, William A	1885	Mar. 1, 1898
Rogers, William B. [5]	(1)	May 30, 1882
Rood, Ogden N	1865	Nov. 12, 1902
Rosa, E. B	1913 [2]	May 17, 1921
Rowland, Henry A	1881	Apr. 16, 1901
Royce, Josiah	1906 [2]	Sept. 14, 1916
Rutherfurd, Lewis M	(1)	May 30, 1892
Sabine, Wallace C. W	1917 [2]	Jan. 10, 1919
Saxton, Joseph	(1)	Oct. 26, 1873
Schott, Charles A	1872	July 31, 1901
Scudder, Samuel H	1877 [2]	May 17, 1911
Sellers, William	1873 [2]	Jan. 24, 1905
Silliman, Benj., sr	(1)	Nov. 24, 1864
Silliman, Benj., jr	(1)	Jan. 14, 1885

[1] Charter members, Mar. 3, 1863.

[2] Biographical memoirs have not been presented.

[3] Resigned 1873.

[4] Dropped —, reelected 1875.

[5] Dropped —, reelected 1872.

Deceased members—Continued.

	Date of election.	Date of death.		Date of election.	Date of death.
Smith, J. Lawrence	1872	Oct. 12, 1883	Watson, Sereno	1889	Mar. 9, 1892
Smith, Richmond Mayo	1890 [2]	Nov. 11, 1901	Wheeler, Henry Lord	1909 [2]	Oct. 30, 1914
Stimpson, William	1868	May 26, 1872	White, Charles A	1889	June 29, 1910
Strong, Theodore	(1)	Feb. 1, 1869	Whitman, C. O	1895	Dec. 6, 1910
Sullivant, W. S	1872	Apr. 30, 1873	Whitney, Josiah D.[3]	(1, 2)	Aug. 19, 1896
Torrey, John	(1)	Mar. 10, 1873	Whitney, William D.[3]	1865 [2]	June 29, 1894
Totten, J. G	(1)	Apr. 22, 1864	Williston, Samuel W	1915 [2]	Aug. 30, 1918
Trowbridge, William P	1872	Aug 12, 1892	Winlock, Joseph	(1)	June 11, 1875
Trumbull, James H	1872	Aug. 5, 1897	Wood, Horatio C	1879 [2]	Jan. 3, 1920
Tuckerman, Edward	1868	Mar. 15, 1886	Woodward, J. J	1873	Aug. 17, 1884
Van Hise, C. R	1902 [2]	Nov. 19, 1918	Worthen, A. H	1872	May 6, 1888
Walker, Francis A	1878	Jan. 5, 1897	Wright, Arthur Williams	1881 [2]	Dec. 19, 1915
Warren, G. K	1876	Aug. 8, 1882	Wyman, Jeffries	(1)	Sept. 4, 1874
Watson, James C	1868	Nov. 23, 1880	Young, Charles A	1872	Jan. 3, 1908

[1] Charter members, Mar. 3, 1863. [2] Biographical memoirs have not been presented. [3] Resigned 1873.

DECEASED FOREIGN ASSOCIATES.

Adams, J. C.
Airy, Sir George B.
Argelander, F. W. A.
Auwers, G. F. J. Arthur.
Backlund, Oskar.
Baer, Karl Ernest von.
Baeyer, Adolf von.
Barrande, Joachin.
Beaumont, L. Élie de.
Becquerel, Henri.
Berthelot, M. P. E.
Bertrand, J. L. F.
Boltzmann, Ludwig.
Bornet, Edouard.
Boussingault, J. B. J. D.
Boveri, Theodor.
Braun, Alexander.
Brewster, Sir David.
Bunsen, Robert W.
Burmeister, C. H. C.
Candolle, Alphonse de.
Cayley, Arthur.
Chasles, Michel.
Chevreul, M. E.
Clausius, Rudolph.
Cornu, Alfred.
Crookes, Sir William.
Darboux, Gaston.
Darwin, Sir George Howard.
Dove, H. W.
Dumas, J. B.
Ehrlich, Paul.
Faraday, Michael.
Fischer, Emil.
Gegenbaur, Karl.
Glydén, Hugo.
Gill, Sir David.
Hamilton, Sir William Rowan.
Helmholtz, Baron H. von.
Hoff, J. H. van't.
Hofmann, A. W.
Hooker, Sir Joseph D.
Huggins, Sir William.
Huxley, T. H.
Ibañez, Carlos.
Janssen, J.
Jordan, M. E. C.
Joule, James P.
Kekulé, August.
Kelvin, Lord.
Kirchoff, G. R.
Koch, Robert.
Kölliker, Albert von.
Kohlrausch, Fredrich.
Kronecker, Hugo.
Lacaze-Duthiers, Henri de.
Leuckart, Rudolph.
Lie, Sophus.
Liebig, Justus von.
Lister, Lord.
Loewy, Maurice.
Ludwig, K. F. W.
Marey, E. J.
Mendeléeff, D. I.
Milne-Edwards, Henri.
Moissan, Henri.
Murchison, Sir Roderick I.
Murray, Sir John.
Oppolzer, Theodore von.
Owen, Sir Richard.
Pasteur, Louis.
Peters, C. A. F.
Pfeffer, Wilhelm.
Plana, G. A. A.
Poincaré, Jules Henri.
Rammelsberg, C. F.
Ramsay, Sir William.
Rayleigh, Lord.
Regnault, Victor.
Retzius, Gustav.
Reymond, Emil Du Bois.
Richthofen, F. von.
Rosenbusch, Karl Harry Ferdinand.
Sachs, Julius von.
Schiaparelli, Giovanni.
Stas, Jean Servais.
Stokes, Sir George G.
Strasburger, Edouard.
Struve, Otto von.
Suess, Eduard.
Sylvester, J. J.
Tisserand, F. F.
Virchow, Rudolph von.
Vogel, H. C.
Waldeyer, Wilhelm.
Weierstrass, Karl.
Weismann, August.
Wöhler, Fredrich.
Wundt, Wilhelm.
Würtz, Adolph.
Zirkel, Ferdinand.
Zittell, K. A. R. von.

Deceased medalists.

	Medal.	Year awarded.
Abbe, Cleveland	Welfare	1916
Albert I, Prince of Monaco [1]	Agassiz	1918
Auwers, G. F. J. Arthur	Watson	1891
Chandler, Seth Carlo	Watson	1894
Gill, Sir David	Watson	1899
Gorgas, William Crawford [1]	Welfare	1914
Gould, Benjamin Apthorp	Watson	1887
Huggins, Sir William	Draper	1901
Keeler, James Edward	Draper	1899
Langley, Samuel Pierpont	Draper	1886
Newton, Hubert Anson	Smith	1888
Pickering, Edward Charles	Draper	1888
Rowland, Henry Augustus	Draper	1890
Schoenfeld, Ed. [1]	Watson	1889
Vogel, Herman Karl	Draper	1893

[1] Not member, or foreign associate of the academy.